the OIL AND GAS JOURNAL

PUBLISHED WEEKLY OCTOBER 31, 1960

Europe's future is tied to petroleum

... with demand due to increase 100 % by 1975. That's the forecast in one of 15 articles in a special section starting p. 77

THE BEIRUT CONFERENCE:

Rift widens between companies, nations; showdown will likely come in January ▸ 51

IPAA forecast: Demand to rise 2.3% ▸ 56

European drilling sets fast pace ▸ 196

These nine vessels, each 30 feet in height and 8 feet in diameter, and fabricated in Wyatt's Houston Plant, comprise one of the world's largest desiccant natural gas dehydration plants. The plant is in operation on the Columbia Gulf Transmission Company main line system at Rayne, Louisiana.

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OIL AND GAS JOURNAL
Vol. 58, No. 44

Contents October 31, 1960

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Special Report: Oil and Gas International

Western Europe Expands on All Fronts in 1960 78
Crude production is up 6%; reserves are up 200 million tons; refinery construction is up 15%; and refining capacity is up 15%.

Future of Western Europe is Tied to Petroleum 80
Postwar economic development has opened a market for petroleum that has become second only to the United States.

Butadiene from Methane at Ravenna 84
By John C. Reidel
This large petrochemical complex in Italy uses a unique combination of processes.

Pipelines Play Key Role in European Growth 88
By Gene Kinney
Pipelines will be the dominant means for transportation of crude oil to inland refineries of western Europe by 1963.

Hassi R'Mel Gas Seeks Road to Market 92
By Edouard Rerolle
Proposed solutions include transporting liquid methane and several pipeline routes across the Mediterranean.

How Shell Cut Pollution in the Rhineland 93
A new processing scheme has cut water and air pollution to an irreducible minimum in this densely populated region.

European Petrochemical Output is Increasing Rapidly 96
By W. P. Gee, H. A. Kirsch, and C. M. W. Orpen
Production rose nearly 500% in the 1953-1959 period, exceeding both industrial and all-chemical production rate of gain.

Report on European Petrochemical Construction 99
Here is a summary of some of the most important construction projects under way or recently announced.

Production Operations in Sicily 101
First commercial production in Ragusa field came in 1954. By mid 1960, 50 wells had been drilled, 46 of which were productive.

World Oil Demand Should Double by 1975 103
By Sir Horace Stephen Gibson
Total demand should be about 40 million barrels per day, just twice the present rate of consumption.

France Steps Up Exploration at Home and in North Africa 105
By Richard F. Hagemann
Here is a detailed roundup on France's domestic possibilities and what may be expected in the North African territories.

Georgsdorf Water Flooding Project Set for Operation 117
By Dietrich Marsal
Germany's biggest water-flooding project will soon be started on the southern flank of Georgsdorf reservoir, Emsland district.

Esso's New Rotterdam Refinery is Completely Air Cooled 123
By D. H. Stormont
The $50 million plant is one of the most modern on the continent. It's built on a site filled 15 ft. above sea level.

How Oasis Oil Co. Conquered the Desert 130
By Robert E. McMillen
Here's a rundown on supplies, practices, warehousing, communications, transportation, and logistics in Libya.

What's Involved in European Importation of Liquid Methane 138
There are a number of legal problems, but none should present much of an obstacle to commercial shipments.

What Does "Oversupply" Mean Today? 142
By P. H. Frankel

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Oct. 31, 1960

Cut in crude imports is proposed by Interior:

New plan could mean a 60,000-bbl. daily reduction in quotas from level permissible during next 6-month allocation period under the old formula.

The changes may not bring an actual cut but will keep quotas from rising (p. 58)*.

Intercompany exchanges of crude under import-control program continue at brisk pace.

Interior reports 371,322 bbl. daily of imported crude is being exchanged for domestic crude during current July-December allocation period. This is almost 40% of total import allocations.

▼ ▼ ▼

IPAA is still committed to seek a new gas law, working with other segments of the industry to find a way out from oppressive federal regulation.

But this warning was handed to independent gas producers by spokesmen for pipelines and distributors:

...Complete freedom from price control is impossible.

...Distributors must be satisfied with any new form of regulation because they are the ones who must sell it to state utility commissions and consumers.

...New regulation must stabilize gas prices at city gates.

...New area-pricing approach of FPC is big step in the right direction and may become basis for a new form of regulation that could become acceptable (p. 57).

Area prices for new gas sales in South Louisiana and Mississippi have been set by the FPC.

Price for each area is 20.96 cents for pressure of 14.65 psi. and 21.5 cents for 15.025 psi.

Ceiling price for rate hikes under old contracts in the two areas is 13.7 cents for 14.65-psi. gas and 14 cents for 15.025 psi. (p. 60).

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*Refers to article in this issue giving more details. When no page is given, the item is a Newsletter exclusive.

Domestic demand for refined products isn't living up to expectations, the IPAA supply and demand committee finds.

The 1960 total for domestic product demand probably will be 9,677,000 bbl. daily, about 50,000 bbl. daily less than was forecast last spring.

Outlook for 1961 is 9,900,000 bbl. daily of domestic product demand, up 223,000 bbl. daily.

Total demand, including exports, will average 9,883,000 bbl. daily in 1960 with the outlook for 1961 at 10,098,000 bbl. daily (p. 56).

Add this to your forecast list:

Mobil Oil marketing executive Leonard S. Marshman predicts total U. S. energy needs in next 10 years will increase about 3.5% a year compared to 2.6% during 1950s.

Oil demand will increase about 2.8% a year compared with 4.6% annual gains in previous period.

Natural-gas demand will gain at rate of 5% a year which is less than the 8.2% gain in the past.

▼ ▼ ▼

Northern Alberta's largest gas field is in the making at Worsley, opened in August 1959.

Shell has four Devonian D3 reef gas wells there with up to 190-ft. of pay. A producing area of 15,000 acres is now indicated with reserves near half a trillion cubic feet.

Geologists have a stake in seeing that proper well-spacing is followed, says Tidewater's E. B. Miller.

Money spent in drilling unnecessary wells could flow into geologic efforts to find new reserves (p. 62).

▼ ▼ ▼

High gasoline taxes will cut into revenue of oil firms and government agencies alike, says Sun Oil Veep Frederick B. Hufnagel, Jr.

Compact cars that lessen the impact of high gasoline taxes, are the reason.

Because of these smaller cars, by 1965 a total of 3.3 billion less gallons of gasoline will be sold. At a national average of 10 cents a gallon in federal and state tax this means $330 million less in taxes to be collected.

Oil stocks are viewed favorably as a good defensive group by Goodbody & Co., brokers, citing these reasons:

Oils are in a relatively strong technical market position, having been fairly well liquidated...Crude inventories are lowest in 14 years...Product prices have recovered...And earnings are rebounding.

Good grade oils are selling for only 10 to 12 times 1960

estimated earnings. And dividends provide returns up to 5.5%.

The 9-month earnings of oil firms look good. Some early reports: Gulf up 10%; Tidewater up 11%; Sun up 8.4%; Conoco up a fraction to highest level in history. Other good gainers are Socony Mobil, Phillips, British American.

▼ ▼ ▼

Mentioned in merger rumors:

Plymouth Oil Co. has been linked with several majors in recent months but President W. S. Hallanan says there've been no discussions of any definite character.

Wilcox Oil Co. has received conditional offer for assets of the company. Outside engineering firm is now making an evaluation of company's reserves.

Continental Oil Co. is buying two Oklahoma companies thereby adding 1,400 bbl. daily of production. Conoco has paid $1.2 million for properties of Dick Wegener and Clyde E. Davis and is offering $10.5 million for properties of Calvert Petroleum Co.

Texas Pacific Coal & Oil Co. has paid $16 million for West Texas and Southeast New Mexico properties of Olsen Oils, Inc., Oklahoma City and Jal Oil Co., Midland.

Outside business activities by key personnel are permitted by about two-thirds of the 195 manufacturing firms surveyed by the National Industrial Conference Board.

Exceptions are where conflict of interest is possible or time demands are excessive.

▼ ▼ ▼

On the international scene:

Russians have served notice on Arabs and West alike they are in the world oil market to stay and implied they intend to grab an even bigger share of the already distressed market for themselves (p. 54).

The socialistic Indonesian regime is holding threat of nationalization over heads of private oil firms as it begins negotiations on tax and foreign exchange matters (p. 73).

Quiet shift in government occurred in Qatar last week when Shaikh Ali Bin Abdullah Bin Qasim Al Thani abdicated in favor of his son, Shaikh Ahmed. The former ruler's nephew, Shaikh Khalifah Bin Hamad, became heir apparent. Qatar has an output of 174,000 bbl. daily operated by Iraq Petroleum Co. affiliate.

Italy's Enrico Mattei is making overtures to India for exploration concessions. His ENI is expected to offer the country the big share of 75-25 profit split on same basis as its deals in Iran, Libya, and Morocco in return for rights in Assam or Kutch.

Market Memo

Oct. 31, 1960

Cooler weather has its foot in the door, and middle distillate prices are firming.

Refiners are holding the line on middle distillate prices, determined to exploit buyer interest at full postings.

Diminishing seasonal gasoline demand—plus excess inventories—makes mandatory higher No. 2 prices in order to hold refiners' price netback.

After all, crude is costing refiners full posted price. Condensate is at premium prices, and higher manufacturing costs are likely just around the corner.

Gulf Coast markets are quiet.

There have been no recent cargo sales at posted prices. Refiners are nervous and hesitant to offer cargo gasoline at discounts unless the offer to buy is firm and for prompt lifting.

But 92-RON gasoline is doubtless available at a discount off its posted price of 11.25 cents in the absence of inter-refinery buying.

No. 2 is firm at its posted 8.25 cents per gallon.

Great Lakes pipeline offerings on all products are holding close to posted prices.

Gasoline continues in good demand at posted price of 12.50 cents for 91-RON, with limited reports of discount offerings at one-quarter cent under posting.

Interest in middle distillates is increasing as November approaches. No. 1 and No. 2 prices are firm at respective postings of 10 cents and 9 cents.

In Chicago, discounts of one-quarter cents per gallon on gasoline, No. 1, and No. 2 are being offered.

Posted prices are unchanged with 92-RON at 12.625 cents, No. 1 at 10.25 cents, and No. 2 at 9.50 cents.

River markets are unstable with but little activity.

Reports of gasoline being offered for up-river movement at one-quarter to three-eighth cents off Gulf Coast low posting, are more frequently rumored as time marches on.

Burning oils are being generally held for one-quarter to three-eighth cents over the Gulf Coast low posting of 9 cents for kerosene and 8.25 cents for No. 2.

Notes: Humble is adding Oklahoma to its marketing territory with a new station in Lawton and is expanding in California with purchase of 23 Richfield stations operated by A. H. Shipkey Co....Tidewater did not make a deal for that 1,000 bbl. of Canadian crude seeking a home last week.

Good Wells Make Good News

Treatments that Improved Secondary Recovery and Water Disposal Wells

OCTOBER 31, 1960

Every well on your lease represents an investment on which you hope to earn a profit, whether it's a disposal, injection or a producing well. If its performance can be improved at a reasonable cost, your net profits should also improve. Dowell treatments have made all types of wells more valuable to their operators. Here are four recent examples of how stimulation treatments by Dowell improved two waterflood producing wells and two water disposal wells.

- Daviess County, Kentucky (Waterflood producing well) This old well had been abandoned as depleted several years ago. Pay was the Cypress sand between 1365 and 1385 feet. When pool was converted to waterflood, well was cleaned and pipe was set for open-hole completion. Before treatment well made only a show of oil. Dowell treated, using Abrasijet* — abrasive jetting service, Waterfrac and temporary plugging material. Formation was jetted for 20 minutes using 5000 pounds sand, then fractured using water with FLA* and 10,000 pounds sand. Two batches of temporary plugging material were used during the treatment to obtain multiple fracturing. 30 days after treatment, production had stabilized at 35 bopd.

- Montgomery County, Southeast Texas (Salt water disposal well) This well had been completed into a Miocene sand between 3357 and 3368 feet. Before treatment, it would take no water (at pressures as high as 800 psi) so the operator ordered a 1000-gallon treatment using regular acid. There was no improvement. Dowell was consulted and recommended treating with 1000 gallons Super Mud Acid. Since the sand was believed to be oil-wet, an extra amount of surfactant was used. During treatment, the well went on vacuum. At last report, it was accepting all available water.

- Lea County, New Mexico (Water disposal well) This well had been completed open hole into the Devonian between 12,207 and 12,463 feet. Before treatment, it was receiving 28 bwph at 4500 psi. Dowell acidized, injecting 10,000 gallons regular acid down 2⅞" drill pipe at 7.5 bpm. After treatment, well was taking 660 bwph on vacuum.

- Osage County, Oklahoma (Waterflood producing well) Before treatment, this well was producing 1 bopd. Dowell fractured using Waterfrac. 8000 gallons gelled water and 16,000 pounds 20-40 mesh sand were injected. Here is production record: Immediately after treatment, 153 bopd; at 30 days, 168 bopd; after 90 days, 342 bopd; at six months, 340 bopd. After 10 months, production was still 84 bopd.

For detailed information — or for prompt service — dial Dowell. Dowell services and products are offered from more than 150 offices and stations in the United States, Canada, Venezuela, Argentina, France, Germany and the Sahara area. Dowell, Tulsa 1, Oklahoma.

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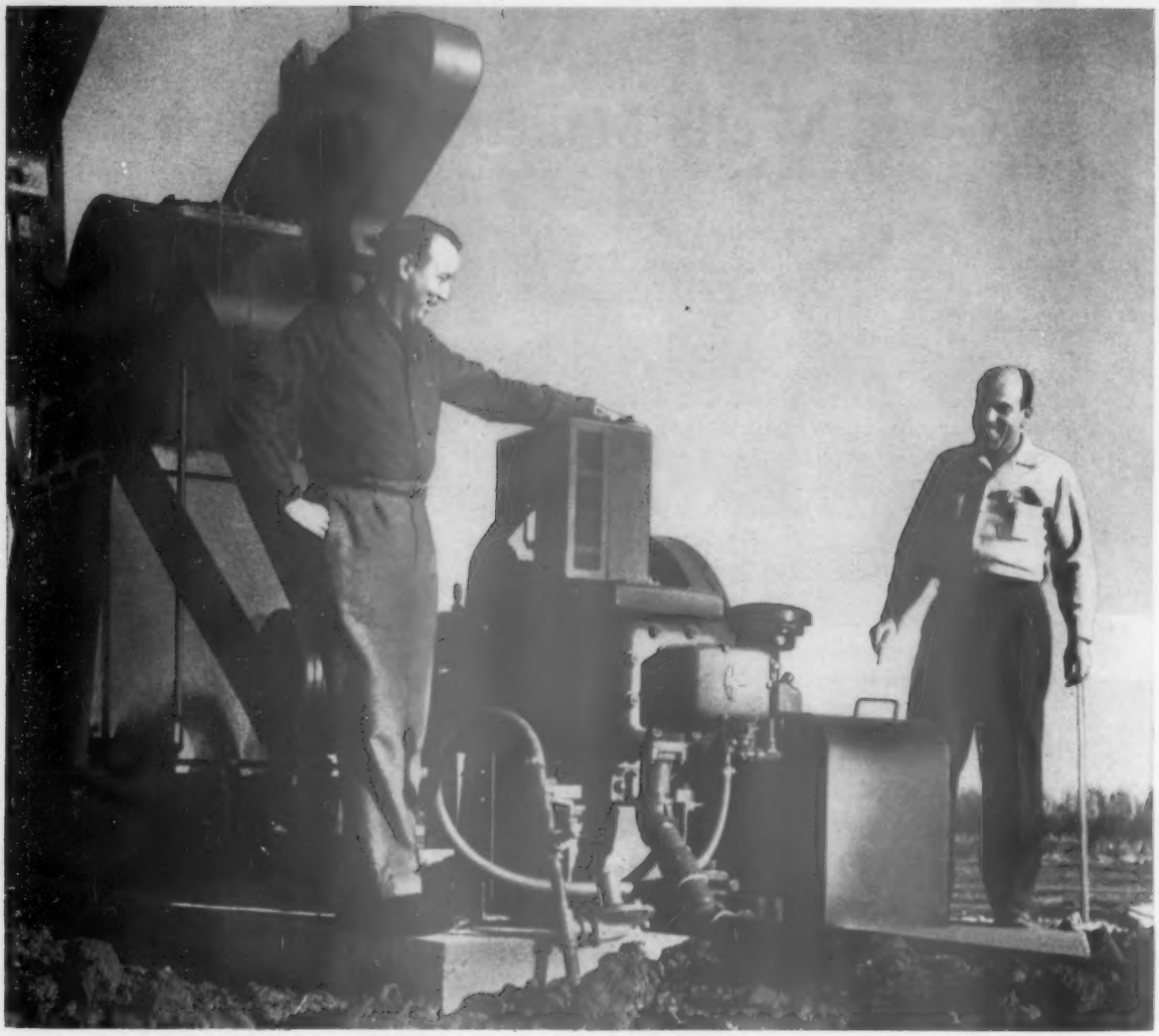

"These single-cylinder Witte F-28 Engines are just what we need . . . they're economical and completely dependable"

says Sheldon Ward, Production Superintendent — John J. Eisner

John J. Eisner is a very active independent operator and producer in the West Central Texas area. His production superintendent, Sheldon Ward, has supervised the drilling and completion work on all the Eisner wells. Dependability and economy induced both Mr. Eisner and Mr. Ward to choose Witte as their power source for all their artificial lifting applications where single-cylinder engines were used.

The F-28 oil field pumping engine is one of a new line of Witte gas or gasoline engines providing exceptional performance . . . long service life . . . reliability at a reasonable price. Witte engines are available in sizes from 3¾ to 42 horsepower, with many models convertible to full diesel. Complete information on them is available through oil field supply stores.

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Fast installation is still another important benefit. Manufactured for "off-the-shelf" delivery, these rugged new plug-in logic elements are pre-tested at the factory to save installation time and expense. With no moving parts, there are no adjustments.

Get all the facts now on the General Electric solid-state supervisory equipment from your nearest Apparatus Sales Office, or write for publication GEA-7043, General Electric, Schenectady 5, N. Y. 513-11

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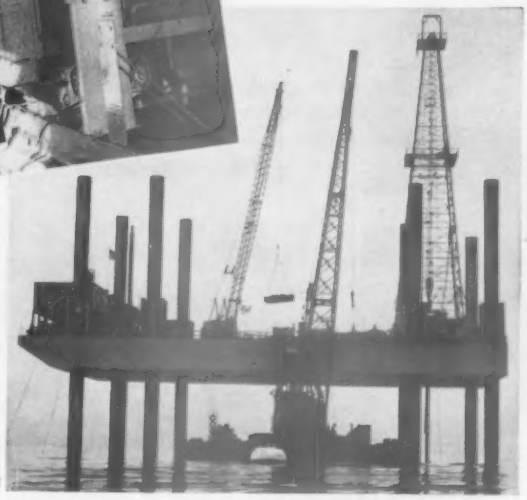

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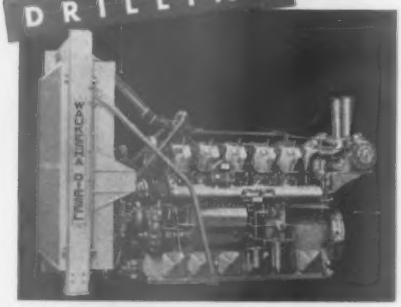
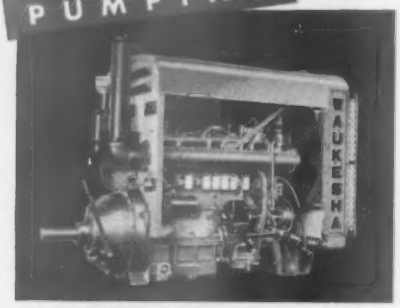
DRILLING



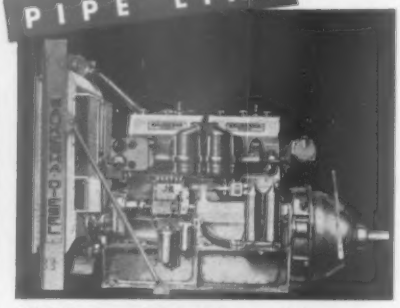
VLRDBSU Turbocharged Diesel Unit—twelve cyl., 8½-in. bore x 8½-in. stroke, 5788 cu. in. displacement, 1190 hp at 1200 rpm.

PUMPING



WAKU Special Long Life Unit—six cyl., 6¼-in. bore x 6½-in. stroke, 1197 cu. in., 125 continuous (65%) hp at 1200 rpm.

PIPE LINE



NKDBU Normal Diesel Power Unit—six cyl., 7-in. bore x 8¼-in. stroke, 1905 cu. in., 270 hp at 1200 rpm, (to 360 hp turbocharged).

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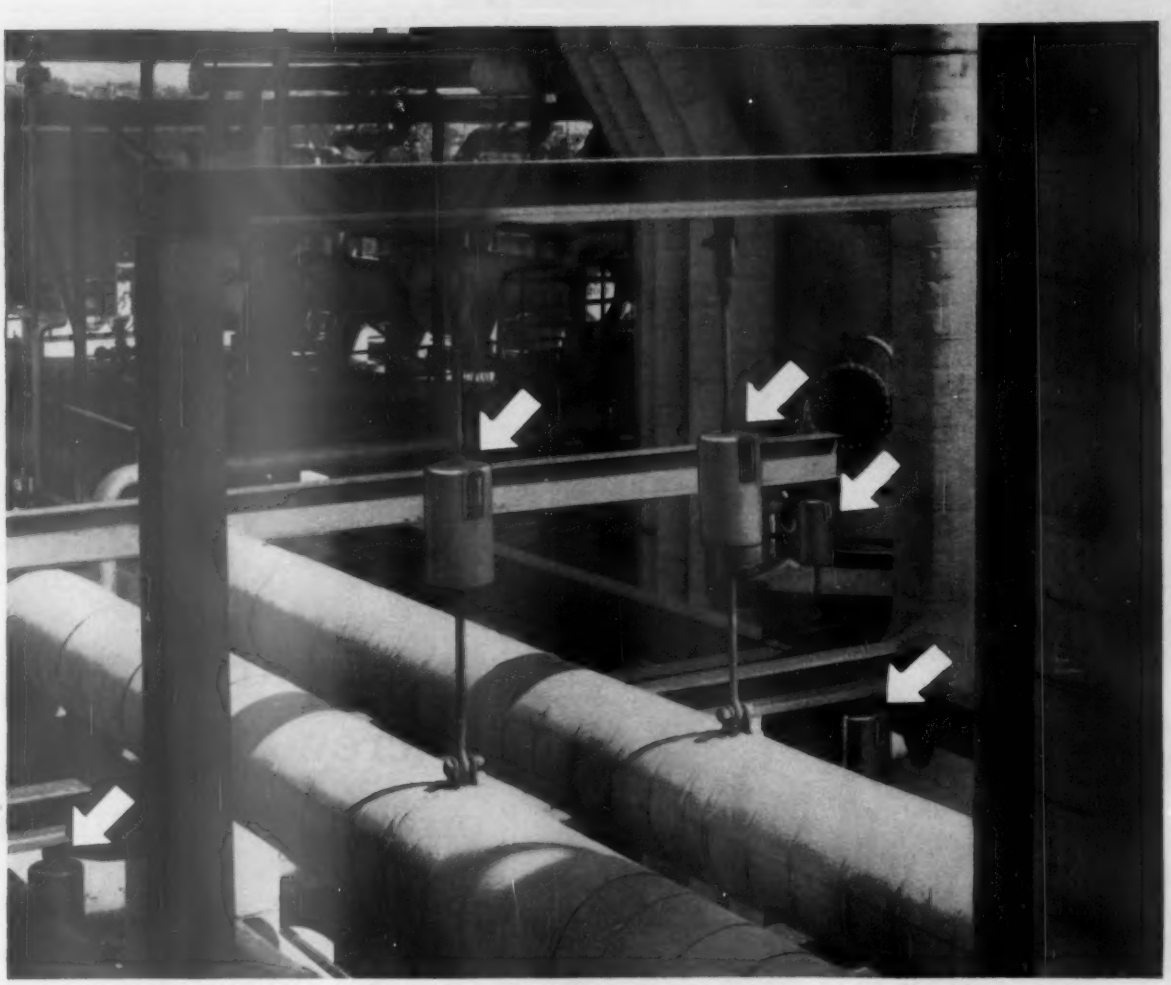
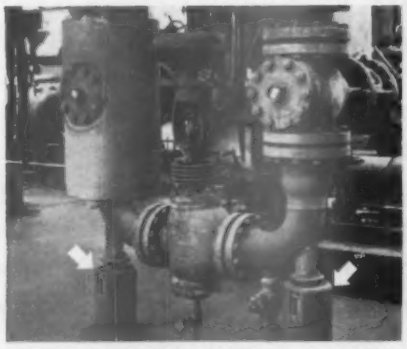
VLRD Series Diesel Enginator—twelve cyl., 8½-in. x 8½-in., 5788 cu. in. engine direct connected to heavy duty AC Alternator—up to 800 KW.



Heater feed line (r.) and return line (l.) at Sinclair Refinery show Grinnell Variable Spring Hangers at work.

Grinnell Hangers support high-temperature pipe lines at Sinclair Refinery



Grinnell Variable Spring Hangers support bottom lines on vacuum still operating at 750°F.

Hot news: Grinnell variable Spring Hangers support pipe lines at Sinclair Refining Company's Marcus Hook, Pa. plant, that operate at temperatures *above 500°F.* Yet these flexible hangers easily accommodate thermal movement in the pipe lines!

Where reactive forces at terminal points must be kept within specified limits, *Grinnell Constant Support Hangers* are recommended. Where pipe lines are subject to vertical movement and restrictive conditions do not require the use of a constant support type, *Grinnell Variable Spring Hangers* are recommended. Where abnormal horizontal movement or vibration in pipe lines must be prevented, *Grinnell Sway Braces* are recommended.

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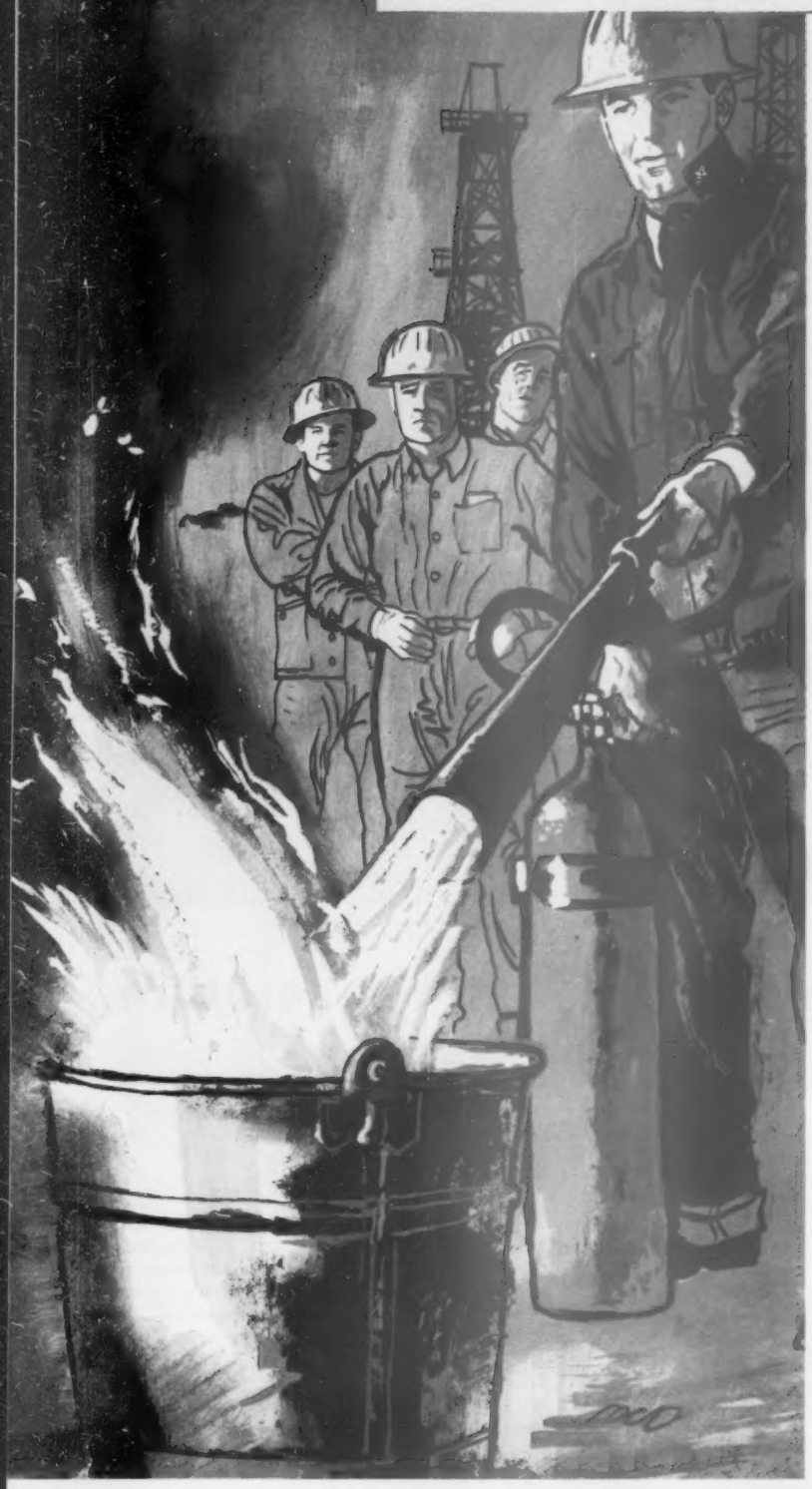

Preparing your crew to fight their No. 1 enemy

A rig fire improperly handled and not immediately controlled often causes serious bodily injury. Sometimes death. Always it is damaging and costly. Liberty Mutual engineers attack this problem by making recommendations as to fire protection equipment, by helping you train your men to fight fires, and by going over your entire rig with a sharp eye for fire hazards. Fire safety engineering is but one of the many Liberty Mutual services that add up to protection in depth. To learn more about Liberty's protection in depth and how it can help lower your business insurance costs, get in touch with the Liberty Mutual office nearest you.

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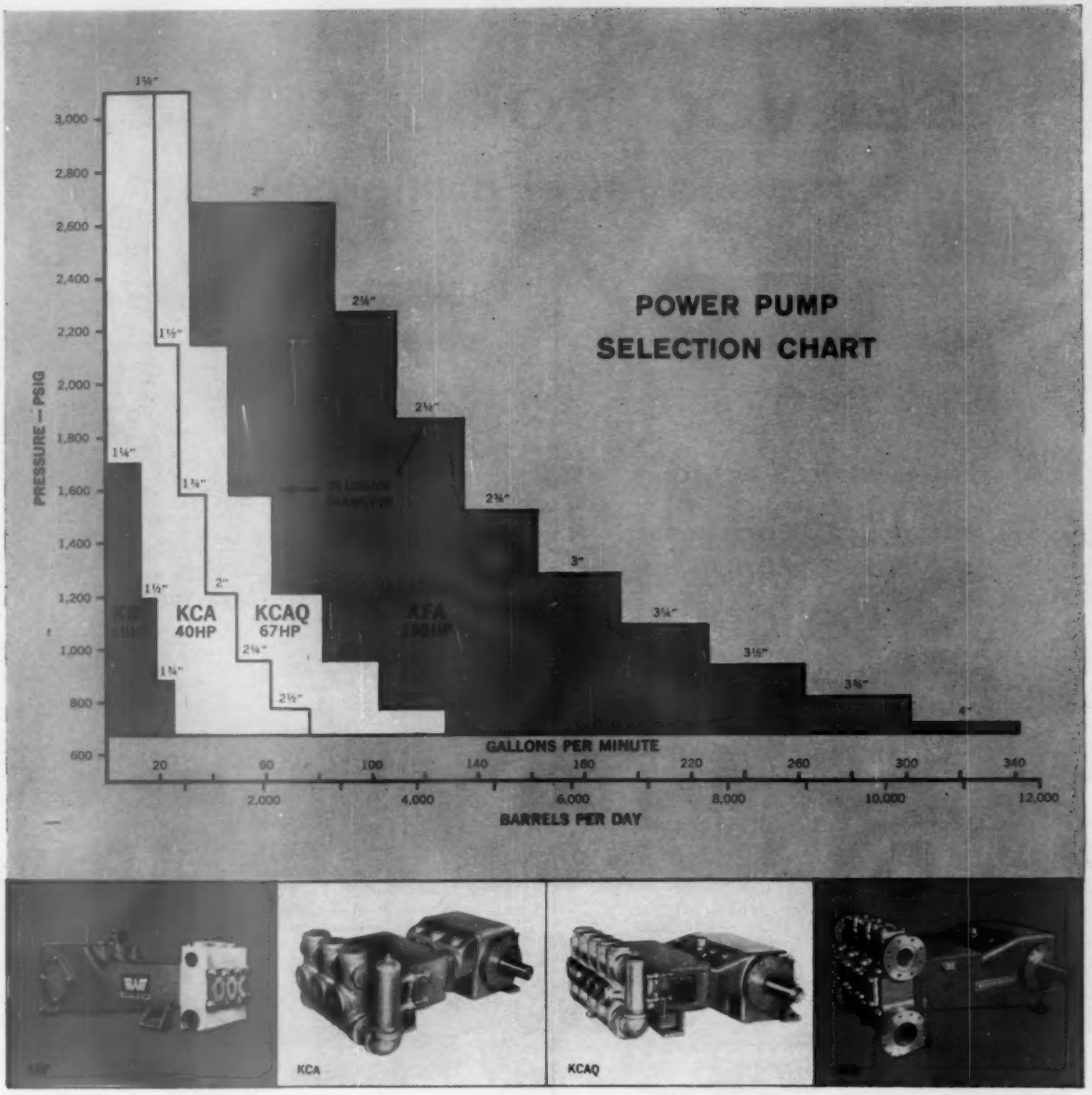

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...to make Worthington your lowest cost high-pressure pump

This is the first public announcement of two new Worthington high pressure, reciprocating pumps. With nominal ratings of 15 and 150 hp, they complement existing pump lines rated at 40 and 67 hp. All are horizontal designs which save you up to 53% on initial cost.

These four pumps—each available in several interchangeable plunger sizes—allow you to buy the most economical amount of pump for your particular application. Should you require pumps of more than one rating, you save money on spares because many parts are interchangeable in the Worthington line.

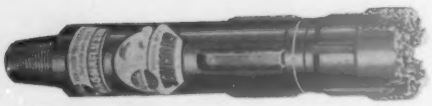
More and more oil producers are choosing Worthington for waterflood applications. A Worthington representative would be glad to explain how this expanded line can save you money on many types of installations.

Get in touch with your nearest Worthington district office. Or write Worthington Corporation, Section 32-8A, Oil City, Pa.

WORTHINGTON

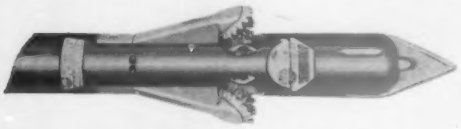
SERVCO TOOL GUIDE

8 ways to lower drilling costs



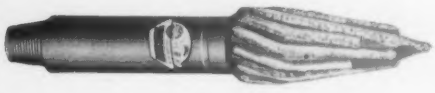
JUNK MILLS Tough, rugged tools for chewing up bit cones, packers, drill pipe, junk of all kinds—at rates that make fishing uneconomical.

SECTION MILLS Mill any length section at rates up to 4′ per hour. Often complete window cut with one set of arms. Mill all weights of casing from 5″ to 13⅜″ O.D.

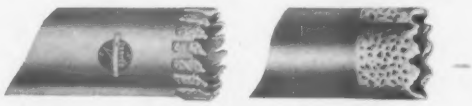


HOLE OPENERS *Rock Bit Type:* Opens hole up to twice the bit diameter in hardest formations. Also, *Blade Type* increases hole diameter up to 17″, simultaneously with drilling, in soft to medium formation.

PILOT MILLS Mill wash pipe, casing, liner, liner hanger, drill pipe or tubing at rates up to 10′ per hour; drill collars up to 2′ per hour. The perfect tool for swaged casing completions.

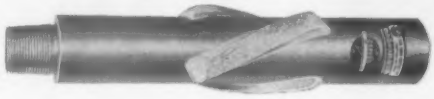


TAPER MILLS Mill collapsed casing, enlarge holes through adapters or retainers, mill out dented casing, and for general reaming.



ROTARY SHOES Difficult washover and milling jobs completed in a fraction of the time required by conventional shoes. Tooth type to cut formation; perforated type to cut iron and formation.

REAMER-STABILIZERS Keep hole to gauge in the roughest, sharpest sands. Save rig time and money by eliminating double drilling and separate reaming operations. SERVCOLOY "W" resists wear 5 to 10 times better than conventional hardfacing.



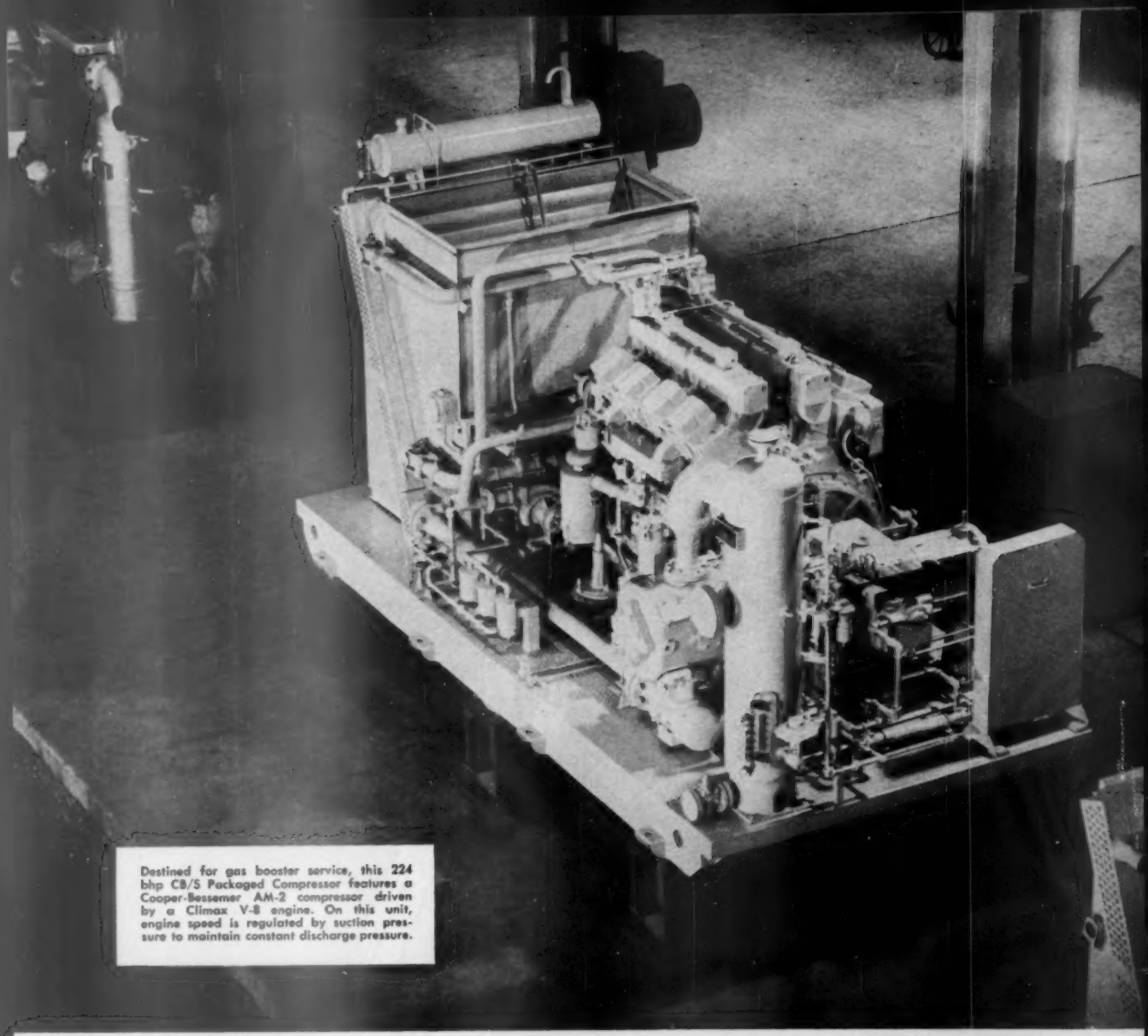
STABILIZERS *Welded Blade Type:* rugged, low cost tools with welded wrap-around wings. *Model "B":* Replacement wings quickly changed without removing body from string. SERVCOLOY "W" makes tools last 5 to 10 times longer than conventional hardfacing.

SERVCO tools make downhole milling and drilling safe and economical. The secret of their phenomenal performance lies in the amazing material called *Servcoloy*. Developed by SERVCO and protected by patents, and constantly improved through research and field usage, *Servcoloy* fully utilizes carbide's cutting properties while overcoming its inherent brittleness. Are you profiting from its use? Your SERVCO representative will be glad to tell you how. Call him today.

SERVCO

...the modern drilling tools

General Offices: 2440 Cerritos Ave., Long Beach 6, California
Canada: 6909 104th Street, Edmonton, Alberta
Venezuela: Maracaibo
France: 106 rue Lauriston, Paris 16
Trinidad: San Fernando
Field Offices: Ventura, Bakersfield, Lafayette, Harvey, Casper, Oklahoma City, Houston, Odessa, Williston



Destined for gas booster service, this 224 bhp CB/S Packaged Compressor features a Cooper-Bessemer AM-2 compressor driven by a Climax V-8 engine. On this unit, engine speed is regulated by suction pressure to maintain constant discharge pressure.

Building packaged compressors is our business . . . our only business. This single objective is the reason CB/S Packaged Compressors are more advanced in design . . . more efficient in the field.

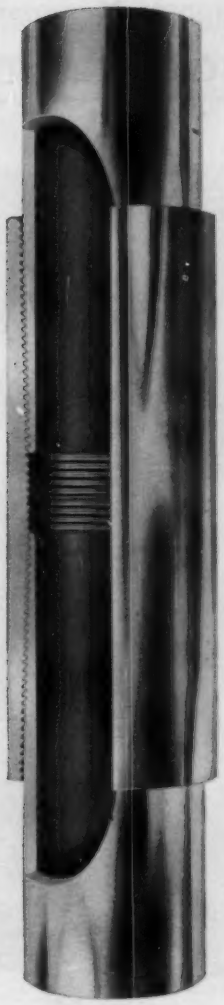
CB/S

PACKAGED COMPRESSORS

CB/S

C-B SOUTHERN, INC., P. O. BOX 19267, HOUSTON 24, TEXAS

A subsidiary of The Cooper-Bessemer Corporation.



Something new in the oil country

USS National Buttress-Thread Tubing

National Tube, developer of Buttress-Thread Casing, now introduces Buttress-Thread Tubing.

This new joint has tensile strength comparable to that of the body of the tubing. Since there is no upset, you get maximum hole clearance and less interference when running. Rugged, flat-crested threads have good stabbing characteristics, better resistance to joint damage and faster make-up. Buttress-Thread Tubing has extended life in service because it can be threaded in the field at authorized machine shops. Tin-plated coupling threads offer you gas-tight joints and reduce your make-up torque. For complete information on Buttress-Thread Tubing, write or call National Tube Division, United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

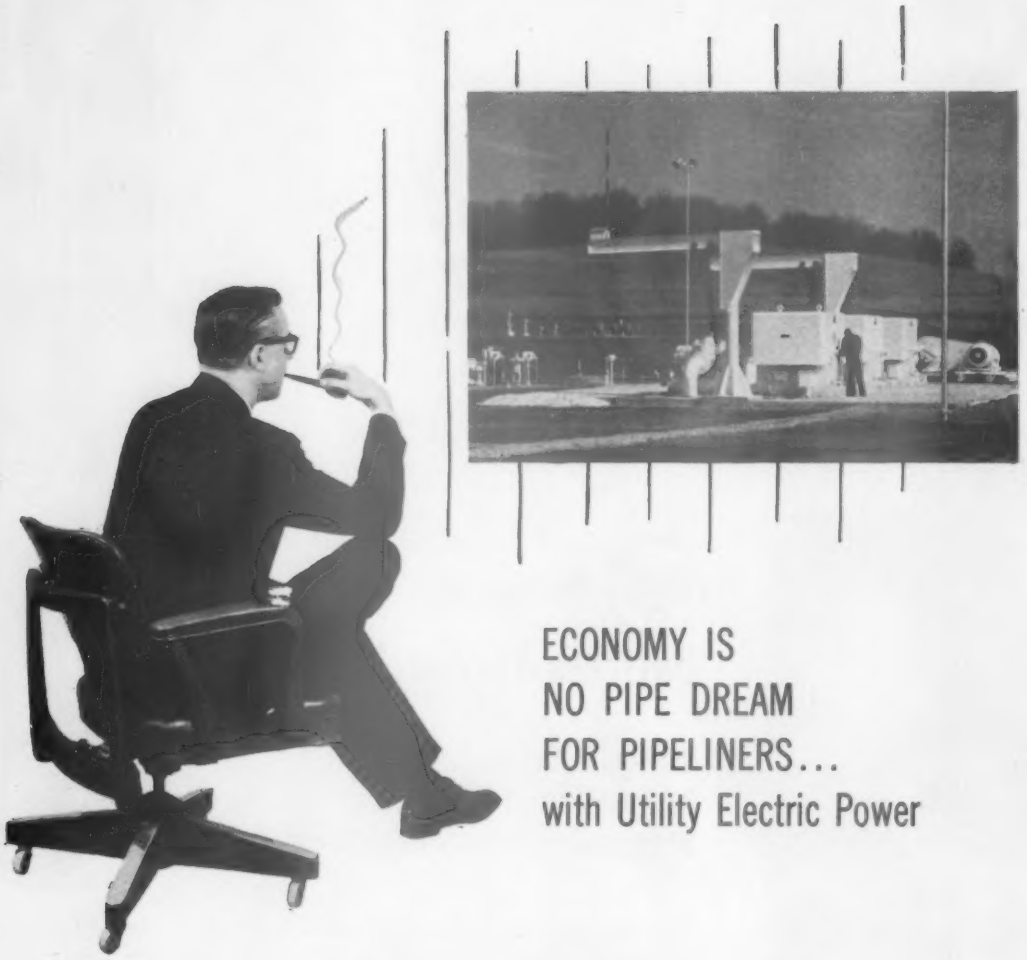
USS and National are registered trademarks

USS National Tube Division of United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
United States Steel Export Company, New York

This mark tells you a product is made of modern, dependable Steel.

Memo to Management:



ECONOMY IS
NO PIPE DREAM
FOR PIPELINERS...
with Utility Electric Power

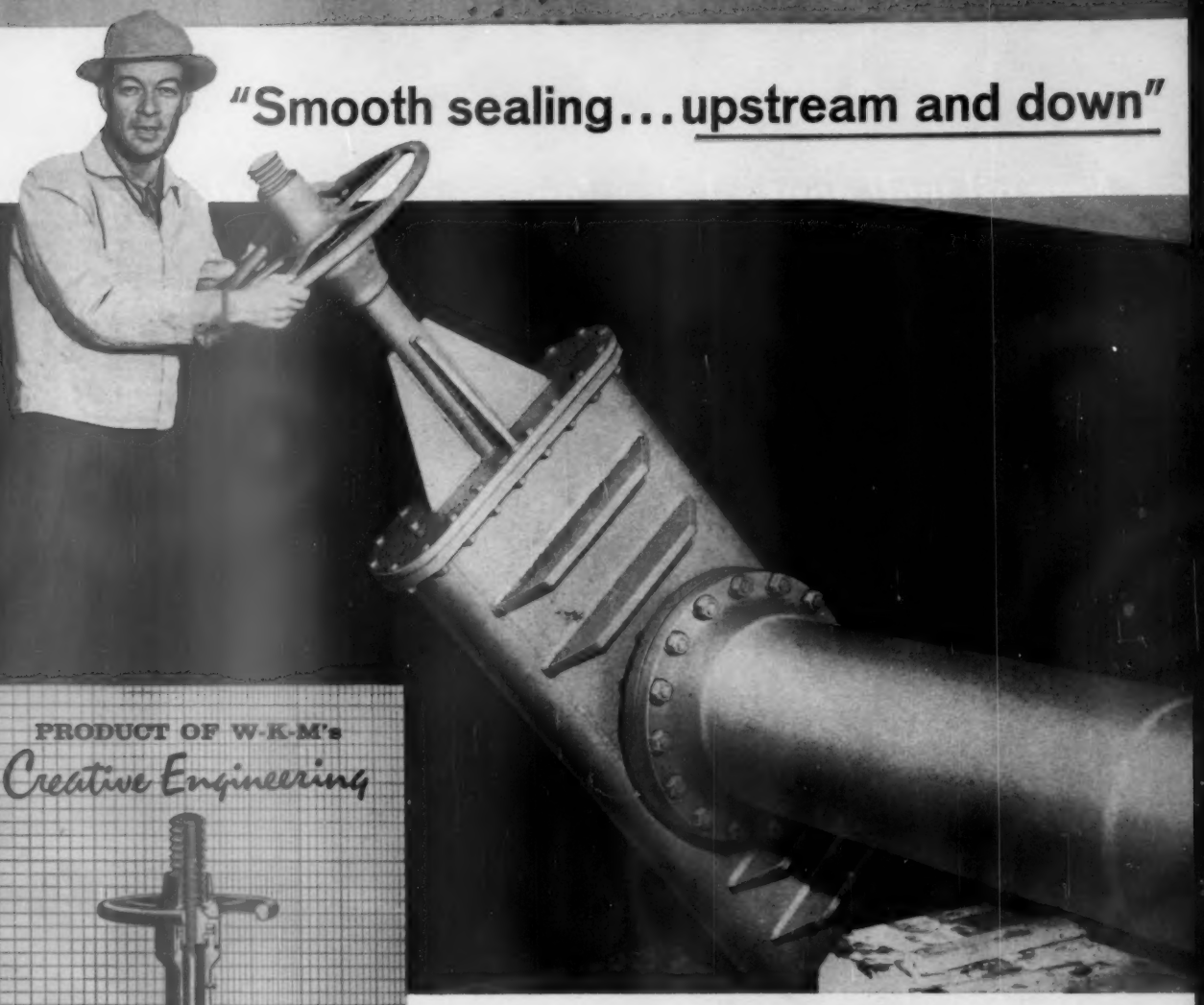
Here is another pipeline installation utilizing economical utility electric power to move an amazing amount of crude each day. This major company knows the value of efficient electric power and why it gives them more dependable, more economical power service . . . when and where it's needed. Now is the time to analyze your power costs. For the facts on electric power savings consult your Utility Electric Power Company.

A list of P.E.P.A. members will be furnished on request

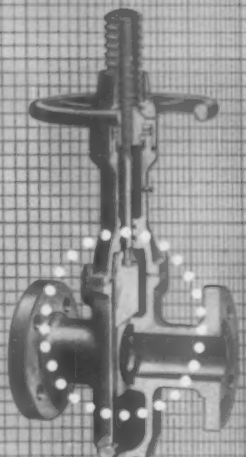
PETROLEUM POWER ELECTRIC ASSOCIATION

BOX 35006, DALLAS 35, TEXAS

"Smooth sealing... upstream and down"



PRODUCT OF W-K-M's
Creative Engineering



FLOATING SEATS MAKE THE SEAL

Seats are specially formulated rubber molded to a hardened steel insert. They float against the gate. When the gate closes, line pressure forces the gate against the downstream seat making a tight seal. The upstream seat maintains its seal against the gate for an upstream seal. The valve provides a tight seal under little or even no line pressure or under vacuum conditions.

W-K-M's new Pressure Sealing Gate Valve

Almost without effort . . . you get a tight seal on *both* sides of the line. The secret? A unique seat design that puts line pressure to work *for* you. The greater the pressure, the tighter the seal!

Seats automatically adjust for wear . . . automatically relieve excessive body pressure. And on-the-line overhaul is easy.

Specify W-K-M's economical new Pressure Sealing Gate Valve for pressures to 720 psi (cwp) and temperatures to 250° F. Sizes 2" through 30". *At leading supply stores everywhere.*

WRITE FOR CATALOG 1200

W-K-M

DIVISION OF ACF INDUSTRIES
INCORPORATED
P. O. BOX 2117, HOUSTON, TEXAS

5925

New oil well control development from Cutler-Hammer

The Cutler-Hammer thermistor detects pump off, then signals transistorized relay which shuts off pump.

At last! An automatic pump off control that ends dry pumping!

- *Cutler-Hammer's exclusive pump off control for oil wells eliminates severe wear from dry pumping*
- *Cuts pumping time up to 25%, yet maintains maximum oil production . . . saves electricity, too*
- *Field tested for 2½ years . . . proved to lower oil lifting costs*

Now one of the biggest problems in oil well production is solved.

The new Cutler-Hammer Automatic Pump Off Control takes the guesswork out of figuring pump off time.

An ingenious sensing probe, (an electrically self-heated thermistor) measures fluid flow electrically. When the well pumps off, the thermistor signals the transistorized relay which in turn shuts off the pump. *Fluid flow* is the gauge—no other factors influence pump off.

You get maximum oil production without undue wear and maintenance. Even under rapidly changing well characteristics the pump off control matches pumping schedules to well production—a real aid to pumpers.

By preventing just one pump overhaul you save enough to pay for a half dozen or more Cutler-Hammer pump off controls. You can't afford to be without them. This unique control is easily installed with any size pump. Better get Pub. LO-16—U27E now for full details.

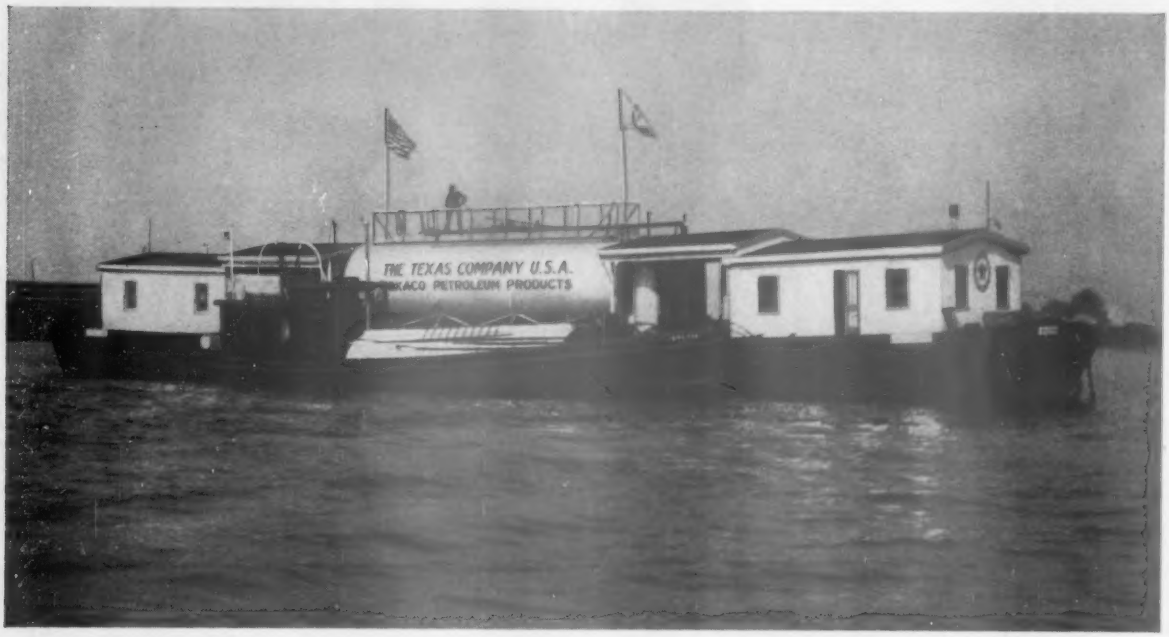
What's new? This new, *better* product is a typical example of what you can expect from the new Cutler-Hammer. We've added new plants, new engineering talent, even a new trademark that symbolizes our new capabilities for the demanding decade ahead. Find out more about our new problem-solving capabilities soon.

WHAT'S NEW? ASK...

CUTLER-HAMMER

Cutler-Hammer, Inc., Milwaukee, Wis. • Division: Airborne Instruments Laboratory • Subsidiary: Cutler-Hammer International, C.A. • Associates: Canadian Cutler-Hammer, Ltd.; Cutler-Hammer, Mexicana, S.A.

From coastal to global operations



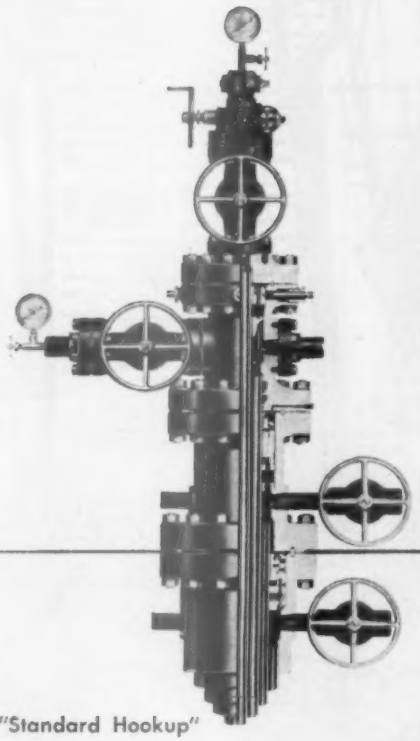
YESTERDAY—Shortly after its founding in 1902, Texaco had only one, small, wooden barge—transporting crude oil slowly along the Gulf Coast and up the Mississippi. Its capacity was 170,000 gallons.

TODAY—Texaco's giant steel tankers, like the Trinidad, ply the sea lanes of the free world, carrying up to 13-million gallons. This fleet forms part of a vast transportation network that helps keep the economy of the free world in balance. Continued Texaco growth, national and global, makes this possible.

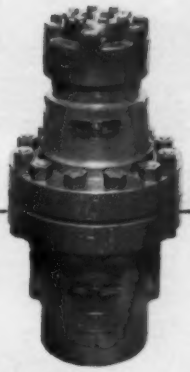
TEXACO

PERFORMANCE AND ECONOMY

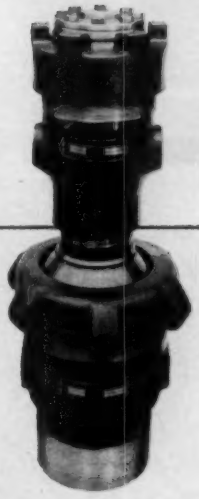
for everyday production needs
are built into the
O-C-T "Standard Tree" and
Low Pressure Equipment



O-C-T "Standard Hookup"



C-18-H Casing Head with
T-H-S Flanged Bottom Tubing Head



C-M-T Casing Head and
T-H-S Tubing Head

While the Oil Center Tool Company is noted world-wide for dual production equipment and high pressure trees, the truth of the matter is many completions require what might be called "standard equipment." O-C-T is noted for this, too.

The "Standard Tree" is simply the combination of an O-C-T casing head, O-C-T tubing head, master valve of your choice, and an O-C-T flow control.

Simplicity is a basic part of the standard's makeup.

The new series of O-C-T low pressure equipment combines simplicity and flexibility. Tubing stripper can be used in combination with other equipment if desired, without the necessity for adding stripper housing or bowl. Threaded tubing hangers are available for use with or without the stripper.

(For additional details on the above equipment, write to O-C-T at the address below)

O·C·T

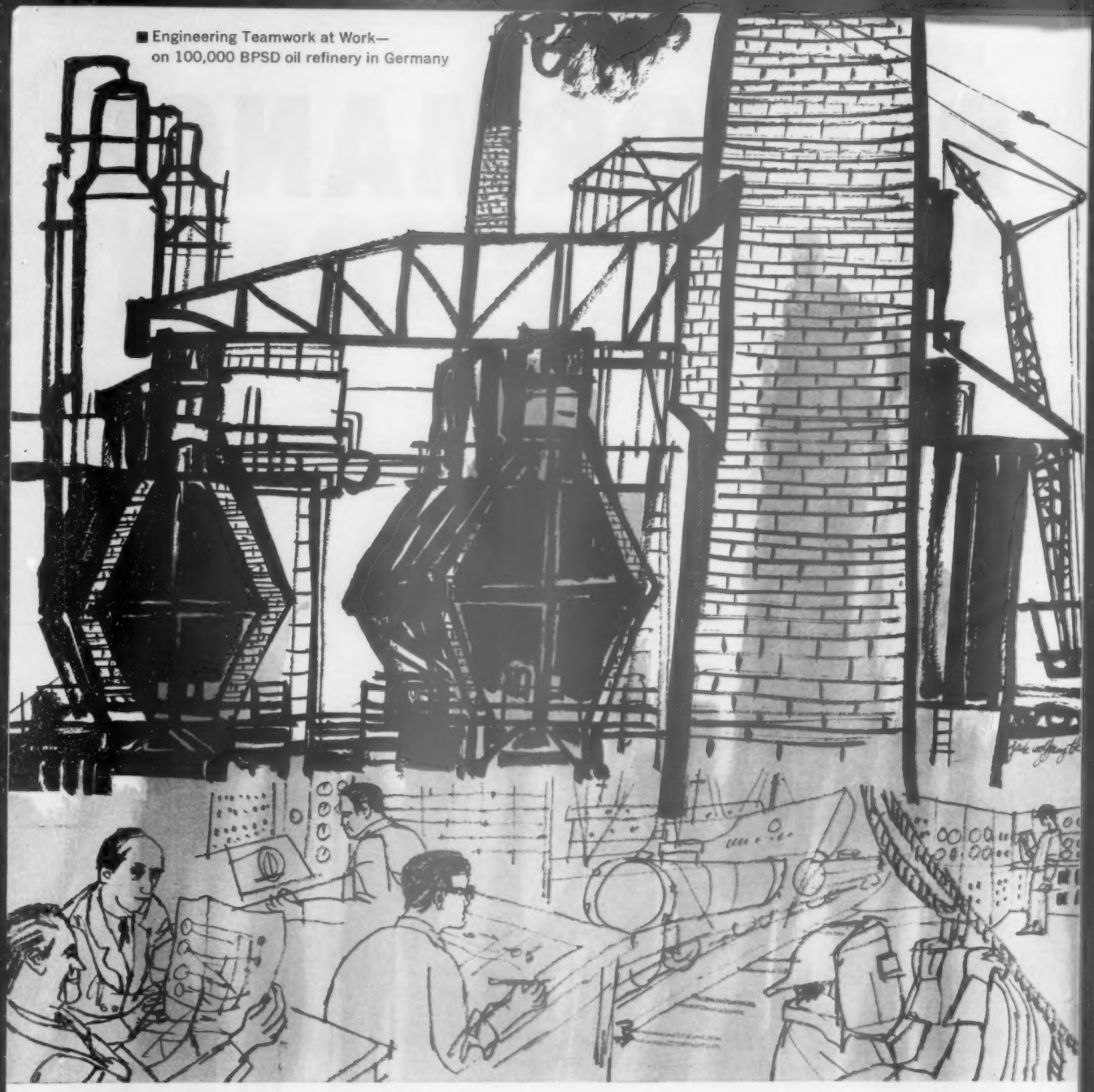
OIL CENTER TOOL CO.

SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

Address Export Inquiries for All Countries to
P. O. Box 3091, Houston, Texas.

where progress is a daily practice

■ Engineering Teamwork at Work—
on 100,000 BPSD oil refinery in Germany



NEWEST RHINELAND REFINERY

A major contribution to West Germany's dynamic industrial growth is the giant new grass roots refinery of BP Benzin und Petroleum A.G. at Dinslaken. When fully completed, in 1961, it will increase the Republic's domestic source of gasoline, oil, and other petroleum products by 100,000 BPSD.

A huge and complex undertaking, this new refinery is the result of close coordination of effort among American, British, and German engineers. Each is making important and specific contributions to the over-all project.

Advisory and consultant services are being rendered BP in Germany on many phases of the undertaking by Kellogg Refinery Consultants, Ltd., Dusseldorf. These include procurement of materials and equipment, construction, operator training—as well as advice to BP Benzin und Petroleum A.G. on the testing and start-up of its refinery. Most of the materials and equipment have been supplied by German industry.

Fried. Krupp, Industriebau has worked closely with Kellogg on the project from inception through construction.

If you are planning to build new processing facilities at home or abroad, Kellogg would be glad to show you how its coordinated engineering-procurement-construction services could work to your company's economic advantage. Please address inquiries to The M. W. Kellogg Company, 711 Third Avenue, New York 17, N. Y.

THE M. W. KELLOGG COMPANY / A Subsidiary of Pullman Incorporated

Offices of other Kellogg companies are in Toronto, London, Paris, Rio de Janeiro, Caracas, Buenos Aires

M KELLOGG W

How one operator used D-Gassers to

reduce gas well costs by about $55,000

A Canadian operator — drilling deep gas wells in the Alberta foothills — is using the SWACO D-Gasser to save about $55,000 per well. Here is how he does it:

This operator, who was developing a gas field in the Alberta foothills, was encountering a gas-cutting problem during drilling that increased costs seriously. The problem was high-pressure, low-volume gas accumulations in a shale section above the main pay or between pay zones.

Until this shale section was reached, mud weight of 10 pounds per gallon was carried. When this section was being penetrated, however, severe gas cutting and "blowing" occurred. The gas cutting then persisted in the form of a two to three hour trip gas for the remainder of the well.

Practice before using D-Gasser

The operator circulated until he could build mud weight up to 11-13 pounds per gallon to control the gas cutting. Lost circulation in the pay section frequently occurred with the heavy mud, and a great deal of lost circulation material was often required. The cost of mud materials to control both gas and lost circulation ran $25,000 or more per well.

Initially, it took anywhere from two days to a week to condition the mud, and in one case it was necessary to set casing before drilling could proceed. In addition, several hours of rig time were lost after each trip gunning out the trip gas.

Practice when using D-Gasser

With a D-Gasser installed, the operator merely starts it up when the gas cutting occurs. Occasionally the preventers have to be closed, and the well placed on choke for a few hours. However, the whole job of mud conditioning can be accomplished in less than one day without increasing the mud weight. Moreover, penetration rates and bit life while drilling using the lower weight muds are substantially improved. Total savings in drilling costs amount to approximately $30,000 per well.

To summarize, the operator has found he saves $25,000 or more in mud costs and something like $30,000 in rig time and other drilling costs.

This case is just one of many examples that prove the SWACO D-Gasser is more than just a safety device to be used for wildcat drilling. It makes possible important reductions in overall well costs in any area where gas cutting is a problem. Contact your nearest SWACO representative to find out just how much D-Gassers can reduce your costs. Also ask him how SWACO Clayjectors and D-Sanders can further reduce drilling costs.

SWACO

SALT WATER CONTROL, INC.
1809 CONTINENTAL NATIONAL BANK BLDG., FORT WORTH 2, TEXAS
Telephone: EDison 2-4433 Cable Address: "SWACO" Fort Worth

LOUISIANA: New Orleans, Lafayette
OKLAHOMA: Oklahoma City
TEXAS: Houston, Corpus Christi, Fort Worth, Kermit
COLORADO: Durango

BETTER drilling rates in all types of muds: T-8, lime, gyp, and low pH, with varying amounts of oil.

BETTER (lower) barite requirements when substituted for oil in muds.

BETTER hole lubrication, in all types of muds, to reduce pipe sticking.

BETTER bit bearing life even in high solids muds.

BETTER geological interpretation and electrical logs; no fluorescence.

PLAN WITH BIT LUBE to drill 5 ways better . . .

MAGCOBAR PLANNED MUD PROGRAMS make the above statements facts, not claims. In high weight emulsion muds, for example, the Magcobar engineer properly substitutes Bit Lube® for some of the oil to cut drilling costs by reducing the amount of barite required. In a typical well, the oil content of the mud was allowed to drop from 11 to 5 per cent. Bit Lube was added to this 17.8 lb./gal. lime mud with these savings in barite:

	Sacks of barite per day	Cost of barite per day	Cost of Bit Lube per day	Cost of Oil per day	Total Cost per day
Emulsion (2 week average)	177	$409.76	$—0—	$74.03	$483.79
Bit Lube and Emulsion (3 week average)	52	120.38	122.43	8.25	251.06

NET DAILY SAVINGS WITH BIT LUBE: $232.73

Not only does Bit Lube give direct cost savings, but it also offers escape from costly pipe sticking, even in extreme directional holes. Bit Lube lowers the friction coefficient of the mud, to give over-all higher drilling mud performance. These savings can be added to those in the chart.

The skilled use of good products like Bit Lube to cut drilling costs is the heart of Magcobar Technology. Let the Magcobar engineer plan the mud program for your next well and this Technology will save for you all along the line.

Magcobar
Complete
DRILLING MUD SERVICE

DRESSER INDUSTRIES, INC.
OIL • GAS • CHEMICAL
ELECTRONIC • INDUSTRIAL

CHECK OIC FIRST...IT PAYS!

SERVICE to meet your valve needs is the "specialty of the house" at your nearby OIC Valve Distributor. As a first-line distributor, he gets OIC's all-out support to insure that you get the service you deserve. OIC's strategically located warehouses, and complete-line factory inventory "backstop" every OIC distributor with a multi-million dollar stock of bronze, iron, ductile iron, cast and forged steel valves. As a result of this strong distributor support, immediate delivery of the more popular items out of distributor's stock is common, and 4 to 5-day delivery out of warehouse or factory stock is routine. When quality is a problem, or delivery is urgent, phone your OIC distributor. Service is his business, and ours.

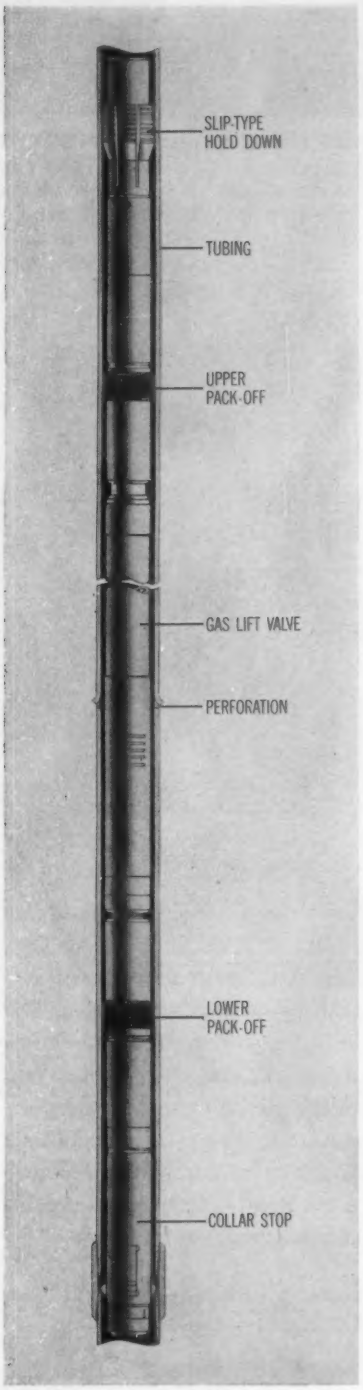
OIC VALVES | FORGED AND CAST STEEL, BRONZE, IRON AND DUCTILE IRON VALVES

THE OHIO INJECTOR COMPANY • WADSWORTH, OHIO

SPECIAL REPORT TO MANAGEMENT

OTIS PRODUCTION NEWS

Volume II, Number 3 **Otis Engineering Corporation • Dallas** *Production Equipment and Services*

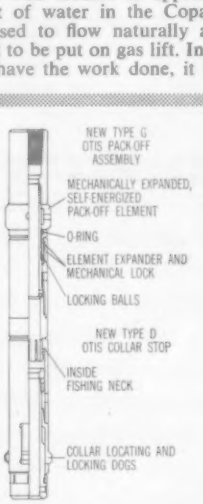


Cost-Conscious Producing Companies Endorse Otis All Wire Line Technique Of Converting Wells to Gas Lift

CORPUS CHRISTI—Eliminate the cost of a pulling unit to round-trip tubing when converting a well to gas lift and you can save an impressive amount of money per well. That's what several of the major producing companies in this area discovered when they started using the new Otis "All-Wire-Line" Gas Lift Conversion Technique.

A spokesman for one of these majors recently stated that his company is most enthusiastic about the technique — especially for water locations — because "(1) it's faster, (2) it's less expensive, (3) it's every bit as efficient as other types of installations they have made, and (4) it eliminates the risk of damage to the producing formation from contamination by mud and/or water in the annulus." Another company reported a savings of $60,000 in converting three, readily accessible, land locations.

As an example of how the technique can reduce the cost of a conversion, take a look at the following case history: A 6800-foot well located in approximately three feet of water in the Copano Bay Field ceased to flow naturally and was scheduled to be put on gas lift. In making plans to have the work done, it was discovered the approach canal had filled with silt and sand, which meant an expensive dredging operation would be necessary before a barge-mounted workover unit could be moved onto location; cost of a workover unit would be $1400 per day, and the annulus was loaded with old drilling fluid. Estimated conversion costs were mounting fast. A conference with the Otis Gas Lift Specialist in the area convinced the operator he should try a Type CG Otis Pack-Off Gas Lift Valve installation.


NEW TYPE G OTIS PACK-OFF ASSEMBLY
MECHANICALLY EXPANDED, SELF-ENERGIZED PACK-OFF ELEMENT
O-RING
ELEMENT EXPANDER AND MECHANICAL LOCK
LOCKING BALLS
NEW TYPE D OTIS COLLAR STOP
INSIDE FISHING NECK
COLLAR LOCATING AND LOCKING DOGS

Straight through, full opening bore of pack-offs, collar stop, and gas lift valve permits maximum production with minimum turbulence.

©1960 O.E.C.

After setting a circulating plug in the tubing at the spot indicated for the lowermost valve, perforating and circulating mud from the annulus, it took the trained Otis Wire Line Specialist only 15½ hours of wire line time to perforate and install five concentric Type C Gas Lift Valves between Type G Otis Pack-Off Assemblies and have the well ready to be put back on production. Eight months following the conversion, the well was still making its allowable in an economical and efficient manner. And to attest to the reliability of the new Type G Otis Pack-Off Assemblies, the well was being produced from the lower-most valve.

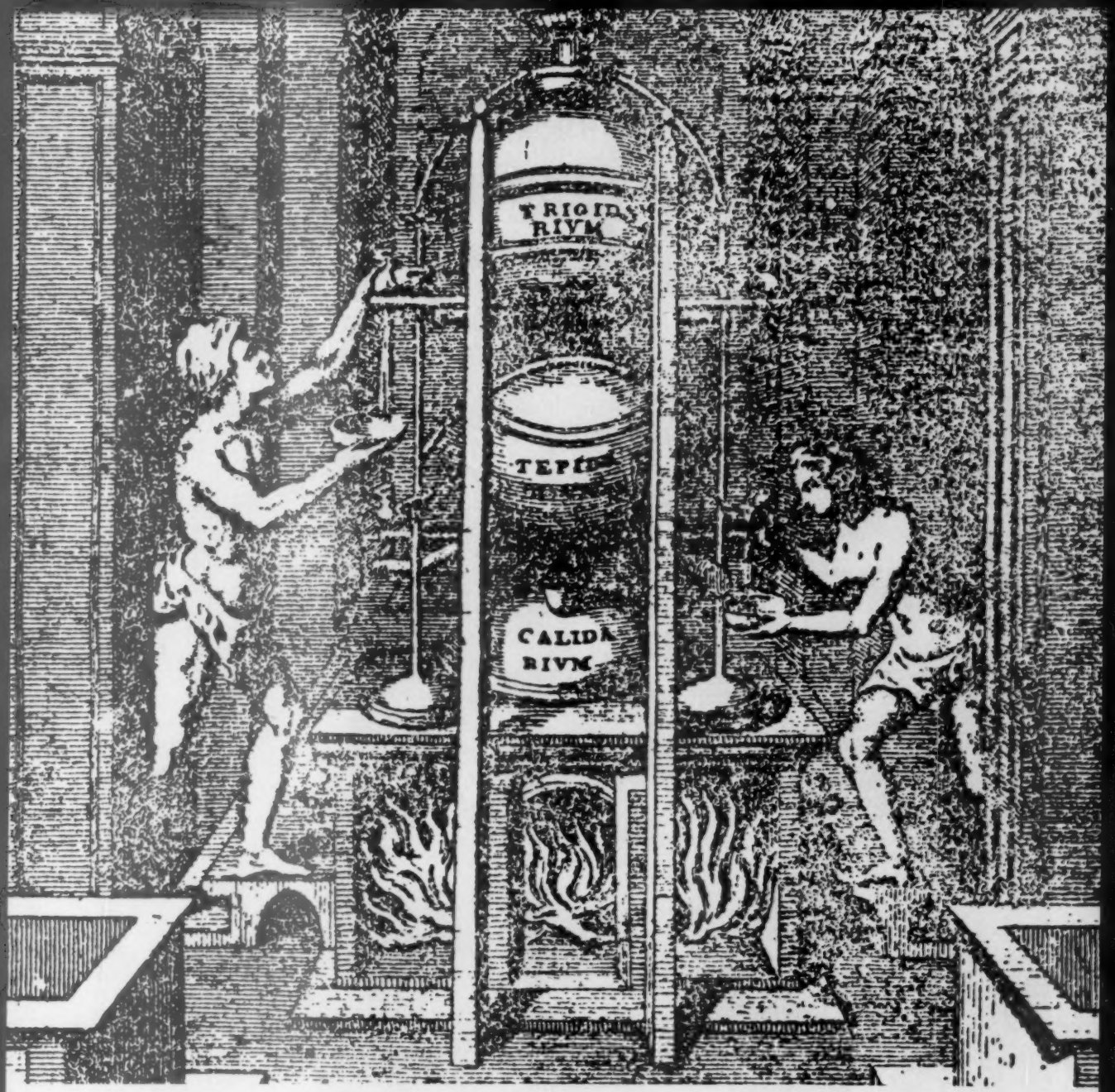
Otis Gas Lift and Completion Specialists are interested in helping you find a way to complete and produce your wells in the most efficient manner. The experience these men have accrued throughout the years is yours to draw from when faced with any down well completion or production flow control problem. Use the knowledge these men have to offer and you will find you'll be spending your production dollars more efficiently. For more information on the Type CG Otis Pack-Off Gas Lift Valve, call the Otis office nearest you or write Otis, Dept. 3-W, Box 35206, Dallas 35, Texas. You'll find your Otis specialists ready to help you — anxious to serve you.

OTIS

Engineering Corporation

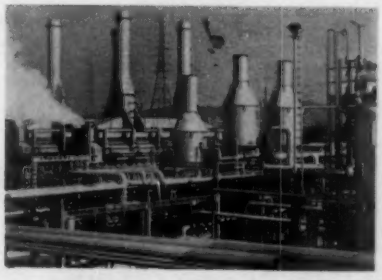
General Offices:

6612 Denton Drive • Dallas, Texas



Where would we be without a still .....?

Without a still or two, many of us would find it dull, dry world. But vastly more important, without the huge, complicated stills that produce the myriad oil products essential for our modern life—for refineries are basically stills—it would be a different world indeed. For the past thirty years, the Japan Gasoline Company has designed and built some of the finest petroleum and petro-chemical plants in Japan. Be sure to consult our staff of experts in the field for all types of advice and assistance when building or enlarging your plant.



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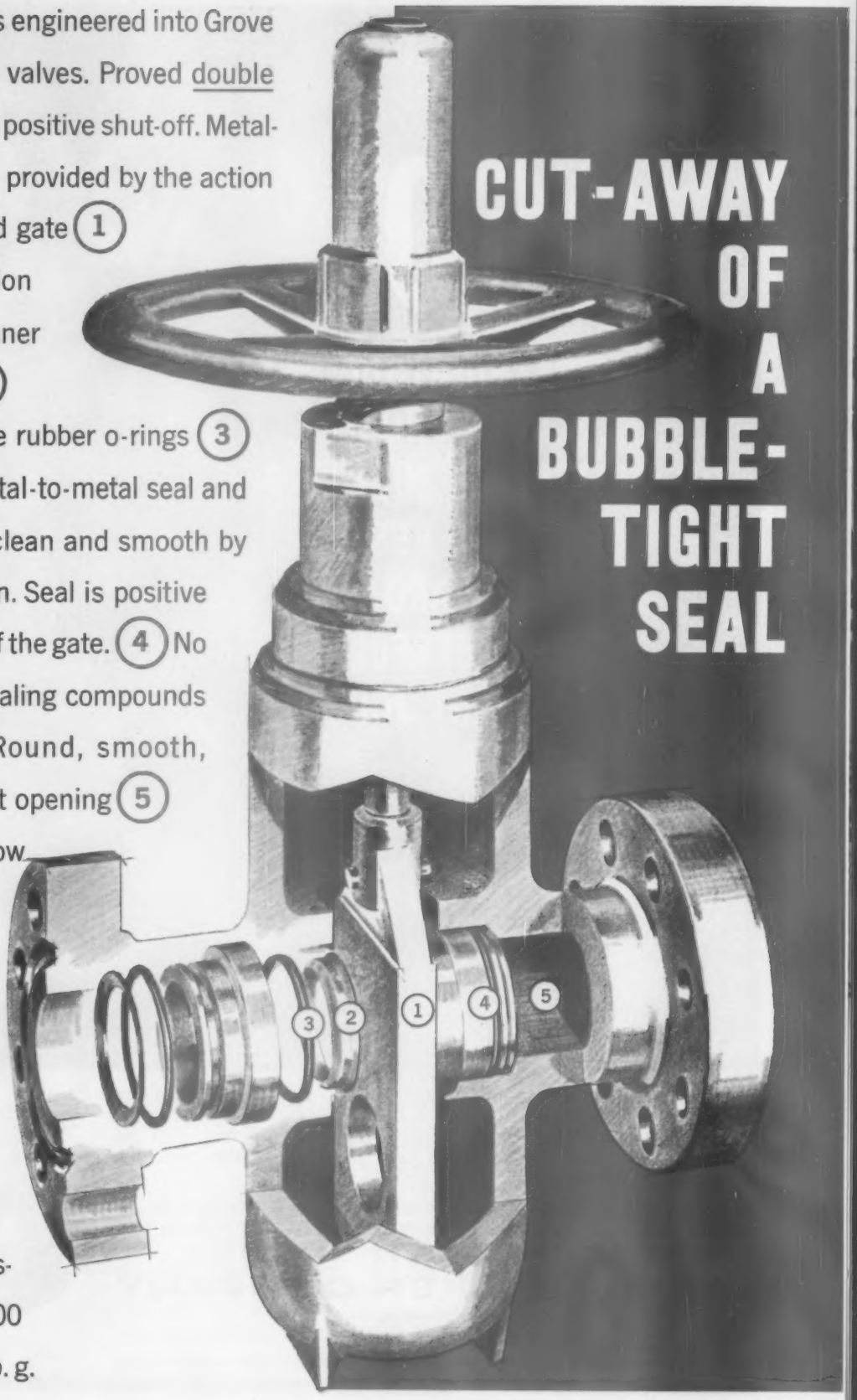

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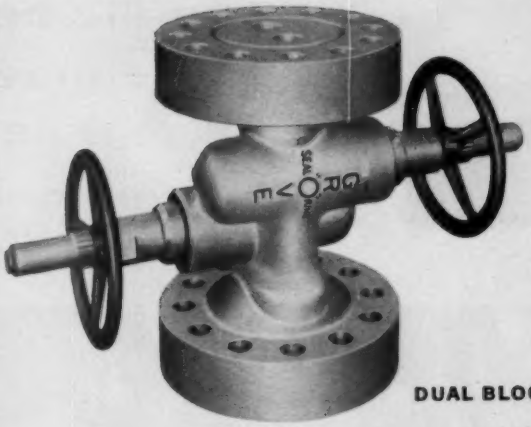
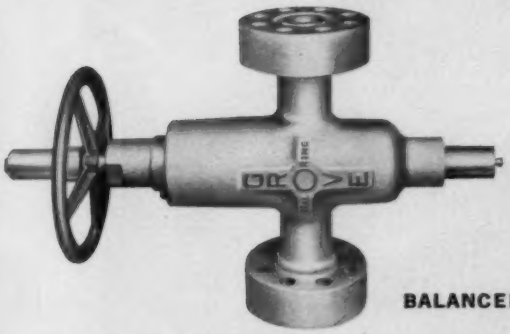
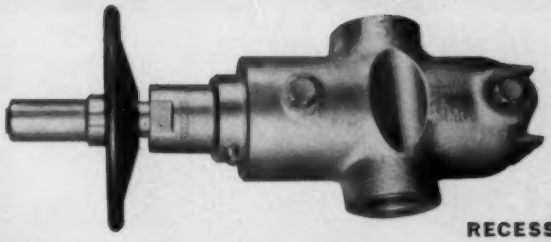


DUAL BLOCK



BALANCED STEM



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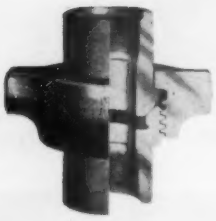

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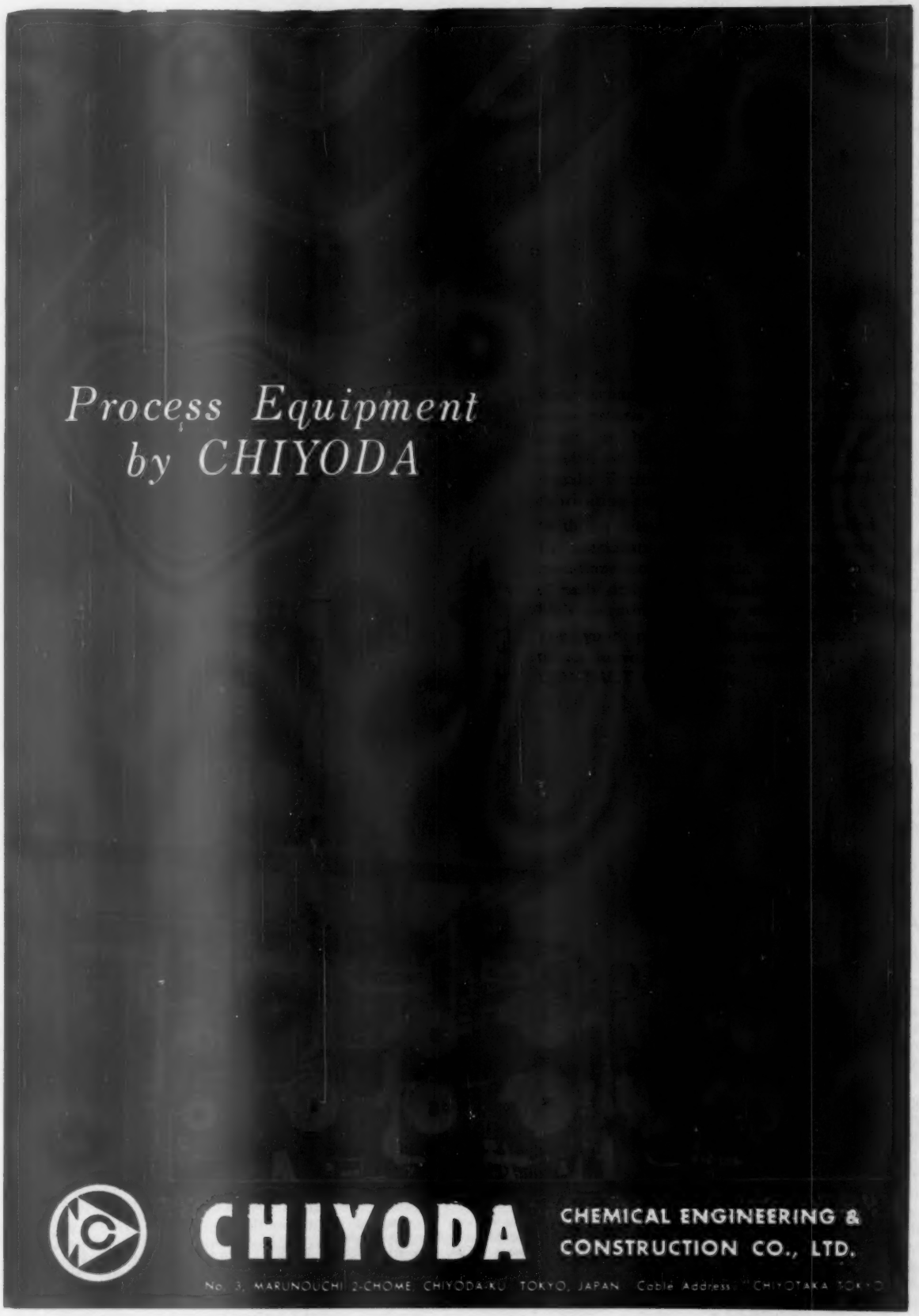
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They Say—

Hobbs annexed by Texas?

Dear Sir:

Although your reporting procedure and information gathered for the Mid-America Pipeline article (OGJ, Oct. 10, p. 124) should be commended, I believe that in the future your drafting staff should correctly locate a New Mexico town before placing it in the state of Texas.

I doubt that the residents of Texas would be annoyed; however, New Mexicans probably appreciate having credit where due.

Mrs. Leland S. Cole
Stenographer
Shell Oil Co.
Amarillo, Tex.

Editor's note: Our apologies to New Mexicans and particularly to the "displaced" city of Hobbs, N. M.

He votes for boats

Dear Sir:

Your crusade for measles, schoolwork, and boat news (OGJ, Journally Speaking, Oct. 10, p. 85) is second only in importance to the article in the same column several months ago in which the memory drum translated "Spirit is willing but flesh is weak" into "Whiskey is good but meat is spoiled," (OGJ, Journally Speaking, July 18, p. 51).

More power to this type of reporting. A bucket of cold water in the proper place on Pete Bike.

T. B. Vance
Geologist
Okemos, Mich.

Anchorage's Kenai wells

Dear Sir:

This is to correct your statement that Anchorage Gas & Oil Co. drilled a series of dusters in the Susitna Flats area (of Alaska), 10 miles to the northwest (OGJ, Oct. 10, p. 114). Statement is damaging and false.

Anchorage drilled four wells, all gas producers, with oil shows which may yet be completed, according to Robin Willis, West Coast consultant.

Further, the location of these, as your map shows, is 10 miles to the northeast.

Further, the present tests are being drilled to confirm the indications of structure obtained by Anchorage Gas & Oil Co. (which should show that Anchorage, whose properties are now being managed by Hawk, has extreme-

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—Leo D. Welch, Chairman of the Board

ESSO

Standard Oil Company (New Jersey)

ly favorable structure) and to find the Hemlock No. 1 and No. 2.

The current Union-Ohio tests are expected to confirm the considerable depth of the Hemlocks in the eastern Cook inlet (Kenai producing zone) area, and may also find the shallow gas sand found by Halbouty.

We trust you will correct this information to avoid damages to our and Anchorage's operations, which may have occurred already.

F. N. Bosco
Chief Geologist and Engineer
Hawk Exploration Co., Ltd.
Anchorage, Alaska.

Editor's note: The wells referred to in the Journal story have been carried as "suspended" for some time.

Election solution

Dear Sir:

In your September 19 edition you have an article entitled "Even a Winner May Not Pay Off" (p. 76). In that article you mention "The dilemma: If oil men support the Nixon-Lodge ticket and it wins, Johnson still will be in the Senate able to get sweet revenge."

As I understand it, the laws of Texas say that Mr. Johnson can run for both the Senate and the vice presidency. Where is the law that says that he has to win either position? If Texas oil men are really concerned about "revenge" if he is not elected to the vice presidency, why don't they simply see that he does not win either post?

It seems like a simple solution to me.

Pauline Ellis
Stenographer
Humble Oil & Refining Co.,
Carter division
Mattoon, Ill.

It makes a difference

Dear Sir:

The tabulation of area prices of sales by independents appearing on page 57 of the Journal's October 3 issue ("FPC Maps New Gas-Regulation Policy") includes a notation "*at 15.025 psi."

According to the table appearing in a copy of the Federal Power Commission's Statement of General Policy No. 61-1, it appears that this should read "*at 15.325 psi."

This is important in West Virginia as the majority of field purchase contracts are written at a pressure base of 15.325 pounds absolute.

W. P. Smith
Vice President
Cabot Corp.
Charleston, W. Va.

2

REASONS WHY YOU GET MORE WITH A HARBISON-FISCHER

Double-Displacement® PAT. ROD PUMP

When a conventional rod pump will no longer produce enough fluid to make the oil allowable, many operators save money by running a Harbison-Fischer Double-Displacement® Rod Pump instead of installing a tubing pump.

The pump is especially efficient where it is desired to lift a greater volume of fluid in order to increase daily oil production. The Double-Displacement has all the production advantages of a full-volume tubing pump, plus the operating advantages of an insert pump that can be run and pulled on the rods.

The pump is also often run when it is desired to produce the same volume of fluid, but at slower pumping rates. By operating old or aging pumping units at slower speeds their service life can be increased, and maintenance costs will be decreased.

The Double-Displacement is a traveling barrel, bottom hold-down assembly with two plungers and two barrel tubes which work simultaneously with a single set of valves. Pumps are available in a wide range of metal-to-metal, H-F Flexite®, or soft packing plungers, with chrome-plated or heat-treated barrel tubes in 2" x 1½", 2½" x 2", and 3" x 2½" sizes.

One installation will convince you that a Double-Displacement Rod Pump is the "Best Pump in the Oil Patch"® for large-volume production. You can obtain full details, illustrated literature, and comparative production data without obligation from your store, one of our many factory representatives, or by writing us at Box 2477, Fort Worth.

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Another plus value:

Seeco-Mul Reduces Metal Corrosion 95%—Even In Hydrogen-Sulfide Brine

Tests Indicate Value As Effective Agent In Protecting Drill Stem From Corrosion Damage

Interest is currently being shown in using Seeco-Mul for still another purpose — as an inhibiting agent to protect drill pipe from corrosion damage. This "plus value" advantage is in addition to its use as a drilling soap, as an extreme pressure bit lubricant, and its primary use as a drilling mud emulsifier.

A series of tests has proved conclusively that, when added to a saturated brine loaded with hydrogen-sulfide, Seeco-Mul reduced corrosion damage by 95.01 per cent. The tests were run for 28 days, using a concentration of two pounds of Seeco-Mul to the barrel.

In a test with a brine in which no hydrogen-sulfide was present, Seeco-Mul reduced the corrosive effects of the fluid by 70.02 per cent during a 19-day period with the same two-pounds-per-barrel concentration.

Seeco-Mul is a dry, flaked compound of sodium salts of fatty and resin acids, plus wood tannins, lignins, and traces of inorganic compounds. The material possesses several unique properties that other additives such as the non-ionic emulsifiers, lignitic materials, and conventional extreme pressure lubricants do not have.

Seeco-Mul is often used also as a drilling soap because it is one of the most efficient surface tension reducing agents available. It is a chemical emulsifier with superior wetting ability, and in addition, Seeco-Mul is an effective extreme pressure lubricant. It deposits an exceptionally tough lubricating film that will withstand high pressure and successfully reduce metal-to-metal contact of the bearing surfaces of the bit.

The combined action of E-P lubrication and low surface tension not only affords greatly increased bit bearing life, but increases the penetration rate also. Since a tough, impervious film is formed on all metal surfaces, hydrogen-weakening (and subsequent failure) of bit bearings, drill pipe, and collars is practically eliminated. This protection is especially valuable in water containing hydrogen-sulfide and other inorganic sulfides ("sulfur water").

Any qualified mud engineer can use Seeco-Mul without extra equipment or special instructions. Just add it to the system through the hopper or the chemical barrel over one or two circulations. Seeco-Mul is packaged in sturdy, moisture-proof 50-pound sacks that are easy to handle around the rig.

Your local mud dealer will be glad to tell you about many other advantages of Seeco-Mul, or write to us for technical literature and a lab sample. We'll be glad to send you full particulars without obligation. Crossett Chemical Company, a Division of The Crossett Company, Crossett, Arkansas.

Tests of Seeco-Mul As A Corrosion Inhibitor

Condition	Percentage Corrosion Without Seeco-Mul	Percentage Corrosion With 2#/Bbl. Seeco-Mul	Percentage Corrosion Reduction
Hydrogen-Sulfide Saturated Brine, 28 Days	.3510	.0175	95.01
Saturated Brine, 19 Days	.0349	.0105	70.02

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"But I am also sure that our industry must take a fresh viewpoint in approaching its problems. There are no easy solutions in our state capitals or in Washington, D. C.

"Two points in particular seem to me to require special attention.

"First, we must make a greater effort to conduct our business in a manner deserving the respect of our customers, government officials, and the public as a whole. One segment of the industry cannot build up its business by tearing down another, nor can we afford to appear to the public as immature, irresponsible citizens. There are too many people in America today who would like to see us regulated as a public utility.

"Second, we must take another look at our expansion programs. We can't long continue to spend more money than we're taking in without building bigger problems for the future than we face today."

John E. Swearingen, president, Standard Oil Co. (Ind.), in a speech to the National Petroleum Association.

Well done!

Dear Sir:

Your article, "More From Drilling Rig Engines" in the September 26 issue (by Ed McGhee, p. 123) was extremely well done.

P. L. Guy
Sales Manager
Waukesha Engine & Equipment Co.
Denver

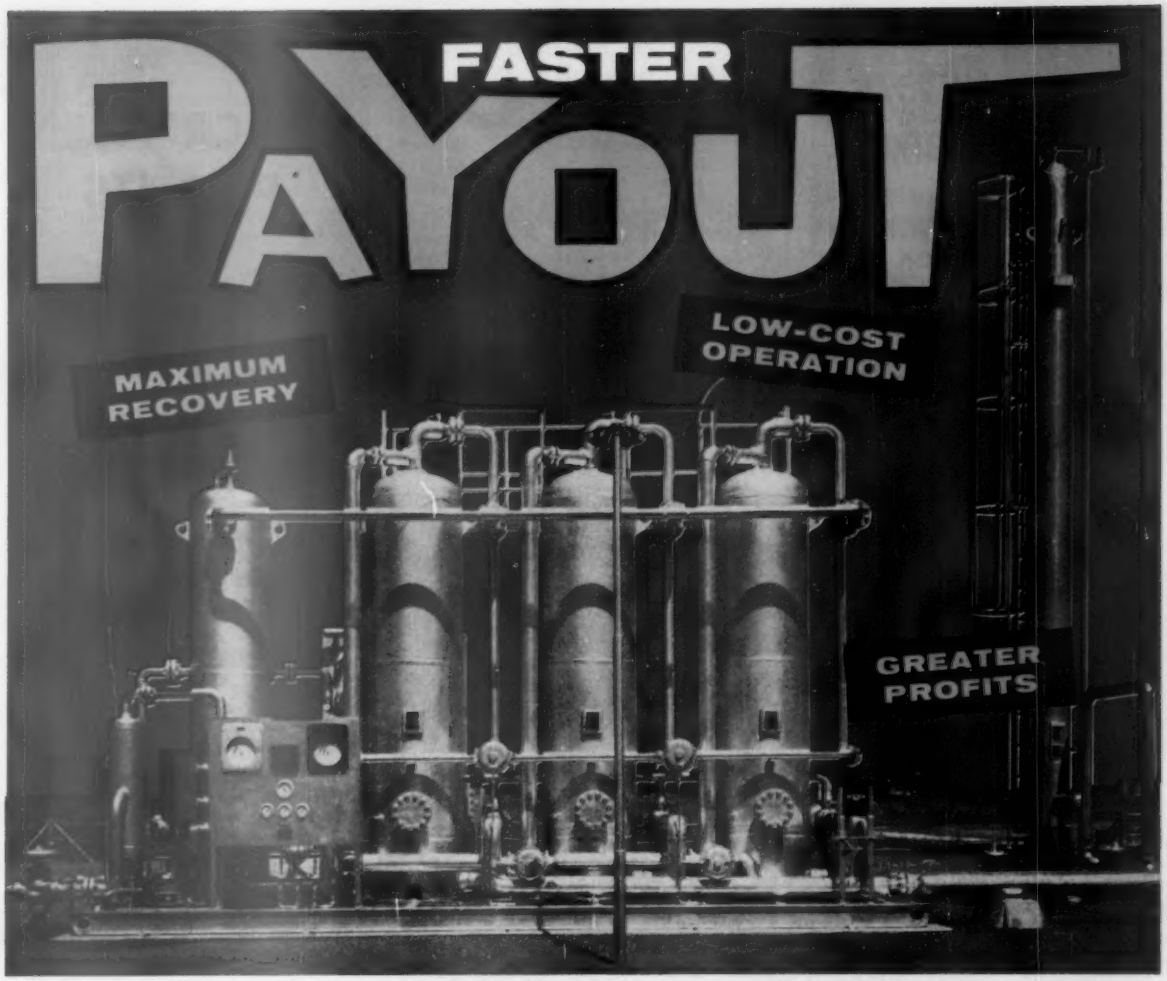
A dewaxing development

Dear Sir:

We read with great interest your answer to an inquiry after manufacturers or patent holders of the urea dewaxing process (OGJ, June 20, p. 127).

The development of the urea dewaxing process has not been stopped. The Heide plant of the Deutsche Erdol-A.G. that we constructed and started up in 1955 processes at the time being 110 tons daily of light lube oils to an average pour point of −20 to −25° C. (paraffin content of the charge: about 17 wt.%).

We are now expanding the capacity of the plant to 200 tons daily. The operation of the plant offers no difficulties since we succeeded in carrying



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The application of the process is not limited; the Heide plant processes the usual light lube oils.

Edeleanu Gesellschaft, M.B.H.
by Dr. H. Langer and
Dr. H. Sprenger

The proper gasket

Dear Sir:

Your article on the Mid-America Pipeline (OGJ, Oct. 10, p. 124) was certainly one of the most comprehensive I have seen in any trade publication.

However, the description of the special gaskets used on the line might lead your readers to think of these gaskets as O-Rings seals. While they appear on the surface to resemble such, they are generally referred to as metal retained molded-in-place seals (trade name Gask-O Seals).

Again our congratulations on a most thorough and informative coverage.

Nelson Harway
Sales Promotion Manager
Parker Seal Co.
Culver City, Calif.

Oil is an economic weapon

"The military role of energy has been made all too evident by incredible power of the H-bomb and lofting of world-circling satellites and gigantic intercontinental ballistic missiles . . . This spectacular packaging of energy has diverted our attention from historic significance of the every-day uses of fossil and chemical fuels.

". . . I think it is significant that the Soviet Union has chosen to base its own economy on petroleum and uses petroleum as an economic weapon in its bid to bring uncommitted countries into the Soviet orbit.

"It is more than coincidence that most of these countries are also the underdeveloped nations. They have a critical need for energy as an essential of economic growth.

". . . While the Soviet Union will satisfy its own industrial hunger with expected growth in domestic oil and gas output, surplus oil production will permit it to shoulder its way more aggressively into world oil markets, although the actual quantity of Soviet petroleum in free-world trade is likely to remain small.

". . . Our own country might do well to keep in mind the correlation between energy supply and living standards when planning its program of economic aid to underdeveloped areas."

George F. Getty II, president, Tidewater Oil Co., in a speech before the national convention of the Quartermaster Association, October 14, Washington.

Confidence in oil reinforced

"We have gone through severe and costly lessons on the economic pitfalls involved in over-importing, over-production, over-refining, over-expansion, over-drilling, and the over-ambitious attitude of some companies . . .

"Confidence in the oil industry's future has been reinforced by two recent developments:

"1. The industry is demonstrating capabilities to deal more effectively with disorders that resulted simply from uneconomic, or unwise, management decisions.

"2. The industry enjoys greater understanding of its problems on the part of government, and greatly improved relationships with government in dealing with these problems."

Col. Alvin C. Hope, president, IPAA, speaking at Minot, N. D. before Independent Oilmen and Landowners Association of North Dakota.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR OF EVENTS

OCTOBER

31-Nov. 4 University of Oklahoma, petroleum land men's institute, Student Union Building, University of Oklahoma, Norman.

NOVEMBER

3 West Central Texas Oil and Gas Association, annual meeting, Hotel Windsor, Abilene, Tex.

3-4 American Association of Petroleum Geologists, Pacific section, annual meeting, Ambassador Hotel, Los Angeles.

3-4 Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa.

6-9 Chemical Institute of Canada, chemical engineering division, conference, Quebec City.

7-10 Society of Exploration Geophysicists, international meeting, Moody Convention Center, Galveston, Tex.

14-16 American Petroleum Institute, forti-

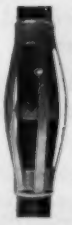
B and W Inc.
SCRATCHERS AND CENTRALIZERS
for a good cement job

CHANNELING
is defined as . . .

CHAN'NEL.ING 1. To form a channel in; to groove. 2. To convey into or through a channel or channels. 3. Oil Well Drilling. In well cementing, a condition resulting from incomplete removal of fluid, gelled mud and filter cake from behind the casing by the ascending cement slurry.

CHANNELING MEANS . . .
(1) An imperfect primary cement job
(2) Mud left behind the casing
(3) Expensive squeezing
(4) A poor completion

B and W
SCRATCHERS AND CENTRALIZERS



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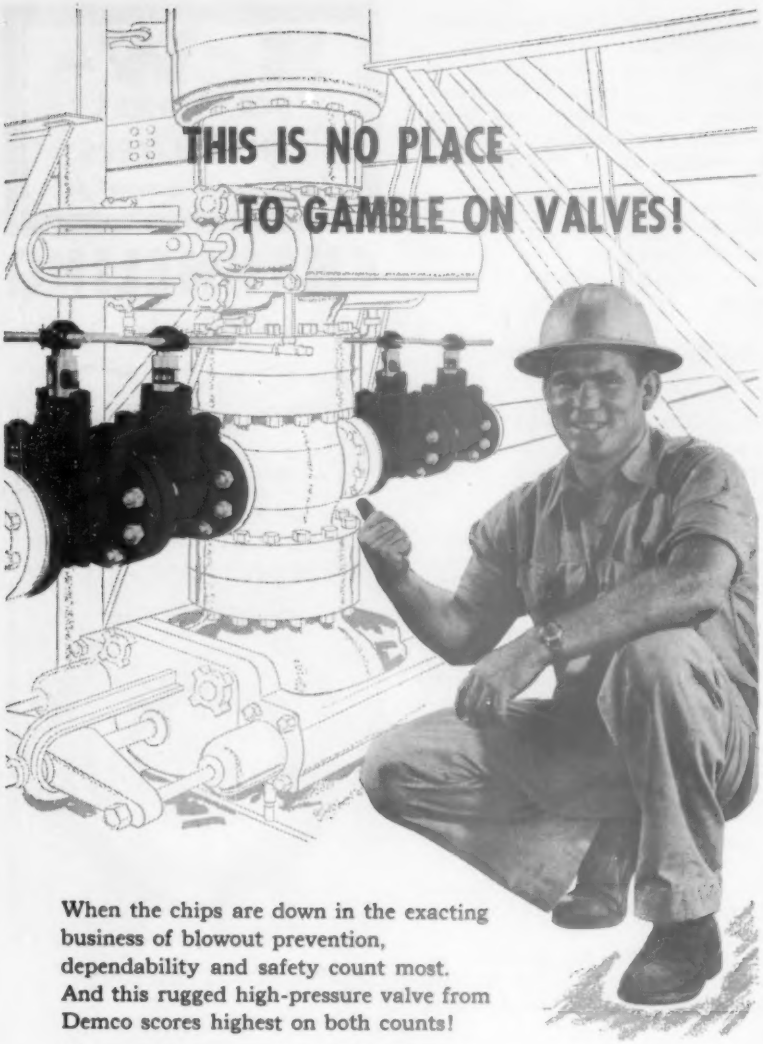

When the chips are down in the exacting business of blowout prevention, dependability and safety count most. And this rugged high-pressure valve from Demco scores highest on both counts!

The rugged construction of the Demco Valve assures its reliability—it *holds every time* against the high pressures of an unexpected flow. You get a positive rubber-to-metal seal without applying undue torque to the stem—a drop-tight seal that you can depend on.

And no matter when you need it, the Demco valve will always operate easier. Fewer parts are subject to wear. Stem threads are constantly self-lubricated and are protected from abrasives with *double* stem seal.

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DRILLING EQUIPMENT MFG. CO. DEMCO OKLAHOMA CITY, OKLA. U.S.A.

eth annual meeting, Conrad Hilton, Palmer House and Congress hotels, Chicago.

14-16 Society of Petroleum Engineers of AIME, Venezuelan sections, fourth annual meeting, Maracaibo, Venezuela.

15-16 University of Kansas, natural-gas pipeline institute, Courthouse, Liberal, Kans.

15-16 Purdue University, symposium on engineering applications of random function theory and probability, West Lafayette, Ind.

15-17 Southwest Research Institute, Air Force, Navy, industry propulsion systems lubrications conference, Hilton Hotel, San Antonio, Tex.

18 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

18-20 Roswell, N. M., Geological Society, field trip, San Andres and North Franklin Mountains, registration November 17, Las Cruces, N. M.

20-22 Fluid Controls Institute, Inc., fall meeting, Drake Hotel, Chicago.

22 Manufacturing Chemists' Association, tenth semiannual meeting and midyear conference, Statler Hilton Hotel, New York City.

27-Dec. 2 American Society of Mechanical Engineers, winter annual meeting, Statler Hilton Hotel, New York City.

DECEMBER

1-3 American Chemical Society, southwest regional meeting, Biltmore Hotel, Oklahoma City.

4-7 American Institute of Chemical Engineers, meeting, Statler Hotel, Washington.

5-7 Interstate Oil Compact Commission, annual meeting, Westward Ho Hotel, Phoenix.

9 Tulane University, School of Law, and American Association of Oilwell Drilling Contractors, fifth annual program on mineral and tidelands law, University Center, Tulane University, New Orleans.

26-31 American Association for the Advancement of Science, annual meeting, New York City.

JANUARY

15-18 Pipe Line Contractors Association, annual meeting, Mark Hopkins and Fairmont Hotels, San Francisco.

16-19 Instrument Society of America, winter instrument-automation conference and exhibit, Sheraton-Jefferson Hotel and Kiel Auditorium, St. Louis.

17-19 Kentucky Petroleum Marketers Association, annual meeting and convention, Brown Hotel, Louisville.

18 Institution of Mechanical Engineers (Great Britain), symposium on pressure vessel research toward better design.

20 Natural Gasoline Association of America, Gulf Coast regional meeting, Robert Driscoll Hotel, Corpus Christi, Tex.

24-27 Society of Plastics Engineers, seventeenth annual technical conference, Shoreham Hotel, Washington, D. C.

FEBRUARY

7-8 University of Oklahoma, School of Petroleum Engineering, advanced petroleum engineer seminar, University of Oklahoma, Norman.

18 Purdue University, business history conference, "Management Decisions Under Government Regulation," Memorial Union, Purdue University, Lafayette, Ind.

SAVE TIME

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ROAD BORING MACHINES

THE FAST, SIMPLE, ECONOMICAL WAY OF INSTALLING CASINGS OR PIPELINES UNDER ROADS, RAILROADS OR RUNWAYS.

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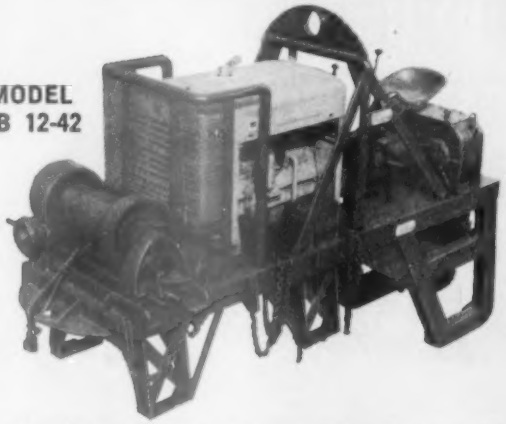
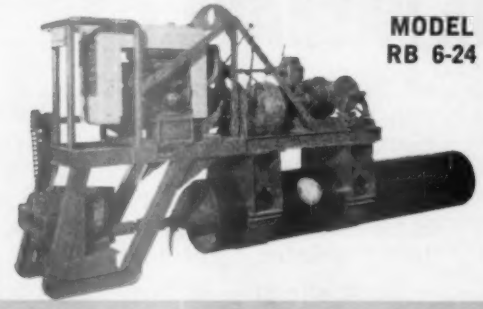
MODEL RB 12-42



Designed to handle the big Jobs . . . will handle 42" casing and bore crossings up to 400 feet

MODEL RB 6-24



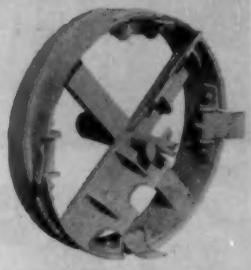
Designed to handle wide range of casing sizes — 8" to 24"

MODEL RB 4-12

Narrow 20" width matches small size casing approaches

3 IMPROVED HEADS

CROSE ROCK HEAD



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Development of Welex's Acoustic Velocity Log adds a sparkling new service to the Welex Simplified Logging Program.

Formerly effective in 90 percent of today's wells,Welex's Simplified Program, with the addition of the Acoustic Velocity Log, now can give the best answers available in EVERY WELL—even the more complex, difficult-to-analyze wells.

The Acoustic Velocity Log accurately determines porosity by measuring the velocity of sound traversing formations. It also is useful to geophysicists for interpretation of seismic records.

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Most effective in formations with intergranular porosity, the Welex Acoustic Velocity Log can be run jointly with a self potential curve, gamma ray curve or caliper log for correlation purposes.

Next time and every time call your nearest Welex representative for the complete package of logging services that will answer the most important question—WILL THE WELL PRODUCE?

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the Journal said...

50 years ago

November 3, 1910

Oil producers consider possibilities of extracting gasoline from natural gas as potential new source of supply to meet steadily growing demand for gasoline.

Gulf Pipe Line Co. halts shipments of Oklahoma crude through pipeline to Port Arthur refinery and terminal to provide space in line at Nacogdoches, Tex., station, and outlet relief for large mounting flush production of booming Caddo field of northwestern Louisiana. Caddo crude, formerly loaded on tank cars at Nacogdoches, now will go all the way by pipeline.

Humble keeps top spot among Gulf Coast fields with daily output of 8,150 bbl. Other Gulf Coast fields in order of productive importance are Sour Lake, Jennings, Spindletop, Batson, Saratoga, Markham, Vinton, and Hoskins Mound.

25 years ago

October 31, 1935

Twenty-year dream of deep production in southern Oklahoma comes true as 8,088-ft. well drilled by Carter Oil Co., Gypsy Oil Co., Magnolia Petroleum Co., and Wirt Franklin Oil Co. in old shallow Fox field, Carter County, blows in flowing estimated 10,000 bbl. of 36.2°-gravity oil and 12 M.M.c.f. of gas daily. New well is deepest in Arbuckle region, and deepest big producer in state.

Union Oil Co. surprises downcast California oil industry with general crude-price increase ranging from 6 to more than 50 cents. Shell Oil Co. follows suit but other buyers uncertain.

10 years ago

November 2, 1950

Plantation Pipe Line Co. awards $7,000,000 contract to Williams Brothers Co., of Tulsa, for new products line to parallel more than 700 miles of its present 1,260-mile system built in 1941. New 18 and 14-in. line will be part of planned $52,000,000 expansion program to boost throughput to 200,000 bbl. per day by 1960.

Malco Refineries, Inc., Roswell, N. M., buys oil properties of Fred M. Manning, Inc., of Denver. Major deal involves 255 wells in Texas, Oklahoma, and Wyoming with daily production of 7,500 bbl.; 4 pressure-maintenance plants; 23 rotary-drilling rigs; and extensive undeveloped acreage scattered over above states and Colorado.

Unitization approved for deep Elk City field in Beckham and Washita counties, western Oklahoma. Project takes in 99 wells on 40-acre units with Shell Oil Co. as operator.

JOURNALLY SPEAKING

Russian oil tourists more diplomatic than diplomats

THE TOURING Russian oil men are making the rounds of the oil country in a spirit considerably more pleasing than the one displayed by another Soviet visitor who failed to get west of Manhattan Island.

These oil men smile warmly; they shake hands vigorously; they make a show of genuine friendship. They nod approving heads at what they see; they do not boast loudly. They are proper guests.

But with it all, they indulge in a bit of gamesmanship forcing their American hosts to keep alert. The Russians, though courteous and pleasant, are well aware that just offstage—and always within earshot—are the voices of their government chiefs shouting invective at America and bragging of Soviet superiority.

And so it is, the oil tourists, a bit more gentlemanly, carry on their own campaign.

Example: The Russians were visiting Rice University's fine library in Houston. They saw the foreign-language publications, including Soviet technical magazines. They noted the presence of the magazine USSR, the Soviet's English-language propaganda publication. Suddenly one of the Russians pointed to another magazine—not Russian—that displayed the big cover headline, "Why We Like War!"

The interpreter, an American, acted quickly. He told the visitors he had no idea what the offending headline meant—but, in any event, the people in this country like peace, not war. He said later it is necessary to call attention to such matters "because such things as this have a habit of showing up in their reports."

(We checked later and found that "Why We Like War!" appeared in a British publication and was a philosophic discussion on why mankind is always at war.)

At another point during the Rice visit, the Russians learned from a rather proud official that students pay no tuition at the heavily endowed institution. Back came the comment from one of the tourists: "Why that's the way we have it in Russia—but the tuition is free in **all** colleges."

Our team won the next round. The Russians showed interest in the relationship of Rice to private industry—whether Rice is controlled by the capitalists. One of them put the question rather slyly: "Do the companies participate in the planning of the institution?" Rice's spokesman used a needle for an answer: "I think it would be fair to say they participate more in the **support** than in the planning."

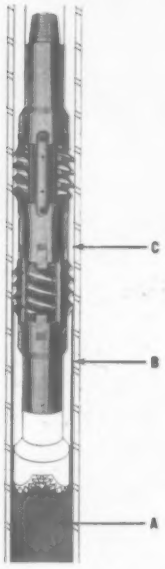
This reporter was caught in a game of gamesmanship himself, but we never found out whether we won or lost. We engaged in conversation one of the Russians who speaks some English. Do the Russians read The Oil and Gas Journal? The reply: "We have an Oil and Gas Journal."

About that time we lost the floor to a pretty Rice coed who wanted to meet a Russian, and we never found out whether our Russian friend was referring to one of the photographed copies of the Journal his Government provides or whether he was letting us know that Russia has an oil publication fully as good as the Big Yellow Book, thank you.

We did learn, however, that Rice University reads the Journal. There on the reception-room table, where the Russians picked up their packets of material for the tour, sat a stack of Journals—a 3-month supply. We regret to report the visitors were too busy to read them.

Howard Wilson
Houston

your WELL'S FUTURE LOOKS GOOD when the "WORKING SURFACE" of the CASING is CLEAN!



A – Cement to be drilled out.
B – This thin cement sheath, which remains after the bit has passed, often interferes with future operations.
C – Cement sheath and ALL other obstructions removed by the Baker ROTO-Vert Casing Scraper. The vital I.D. of the casing is left clean and smooth, safe for all future down-hole operations.

It's simple and inexpensive to run a Baker Casing Scraper just above the bit when drilling out cement, or following perforating operations, to provide a bright future for your well.

No obstructions will remain to cause premature setting of close-tolerance tools. Rust, mill scale and paraffin will be scraped away, and there will not be any sharp burrs to slash and ruin swab rubbers or affect the performance of packing elements on testers, packers and cement retainers. Even the thin, brittle cement sheath which prevents the slips of pack-off tools from gripping the casing, are scraped away.

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Available from the Baker Servicepoint in your area, on a rental basis.

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Don't assume oil demand will grow—foster it

IN THE EASTERN HEMISPHERE the petroleum industry stands today much where it stood in North America not so many years ago.

Demand in Europe is increasing rapidly, many new companies are entering the business, old distribution patterns are changing, and there is a general air of expansionism.

At this point it would be wise for the operators—and the governments—involved to take a leaf from the experience of the American industry and realize that petroleum may not always be an industry of automatic growth and an unlimited source of wealth.

GROWTH IN DEMAND for oil comes from two sources: increases in industrial activity and living standards, bringing higher per capita use of energy; and substitution of oil for other forms of heat and energy. And each of these has limits.

Coal and other fuels can't be crowded over indefinitely. And mechanization of industry, agriculture, and transport in a particular country will pass its crest in time.

Inevitably there will come a slowdown in oil's demand growth in any area. If industry can anticipate this and act accordingly it will avoid many of the troubles now facing Western Hemisphere operators.

Operators should beware of excess capacity and should plan to rationalize the industry so it will not bankrupt itself by being overextended when demand patterns shift or the growth rate flattens off.

Governments, too, must use foresight, in both producing and consuming nations. They should not count on ever-increasing revenues from production taxes and royalties, nor from import duties and sales taxes on products.

In the past, oil's "Midas touch" has often blinded both operators and governments. When demand seemed insatiable and world supplies seemed chronically short, industry made wasteful expenditures, landowners obtained exorbitant concession terms, and governments viewed oil as an unlimited source of revenue.

As the U. S. and others are now painfully learning, oil's growth rate can slow down. And when surplus capacity coincides with slackened demand there are financial troubles for all concerned.

BUT THERE'S A POSITIVE SIDE. Demand for oil will continue to grow, world-wide. And growth can be promoted in any area by commercial and governmental policies that make it readily available at reasonable prices.

In the long run there will be more income for all to share if attention is concentrated on cultivating new markets, both in industrialized and underdeveloped countries, and in keeping prices low enough to encourage additional consumption everywhere.

LOOKING UP—Length of drill starts into the hole after change of bits. Falcon Seaboard Drilling Co. of Tulsa is drilling this well with a 9,500-foot string of Pittsburgh Seamless 4½-inch Grade E drill pipe. Falcon Seaboard has used Pittsburgh Steel tubular goods and an independent distributor for many years with pleasing results.

Pittsburgh Steel's Independent Distributors...

PUT THIS IN YOUR PIPE---SERVICE!

Drillers who use Pittsburgh seamless on well after well have a lot more than dependable drill pipe, casing and tubing going for them.

They have what Falcon Seaboard Drilling Co. of Tulsa calls "fair treatment from the mill" and—independent distributors who go more than the proverbial extra mile to provide service.

Boone Smiley, manager of the Mid-Continent Area for Falcon Seaboard, said:

"We've used Pittsburgh Steel's independent distributors through the years in times of short supply and when pipe was readily available. We've always felt that Pittsburgh Seamless did a job for us and the mill has always been fair."

Photographs on these pages show effective results of the close relationship between drillers and operators on one side and a Pittsburgh Steel independent distributor on the other. Here, near Maysville, Okla., Falcon Seaboard is using 9,500 feet of Pittsburgh Seamless 4½ inch O.D. Grade E Drill Pipe on the fourth well the string has drilled in the area in recent months.

The independent who supplied this drill string to Falcon Seaboard sold the first string of oil country tubular goods manufactured by Pittsburgh Steel. Continued progress through the years has been based on *service* to the trade.

"We can't afford to get lazy," declared William G. Rudd, the distributor's sales manager. "The oil business is always subject to critical emergencies and they all have big dollar signs. It's up to us to pitch in and help."

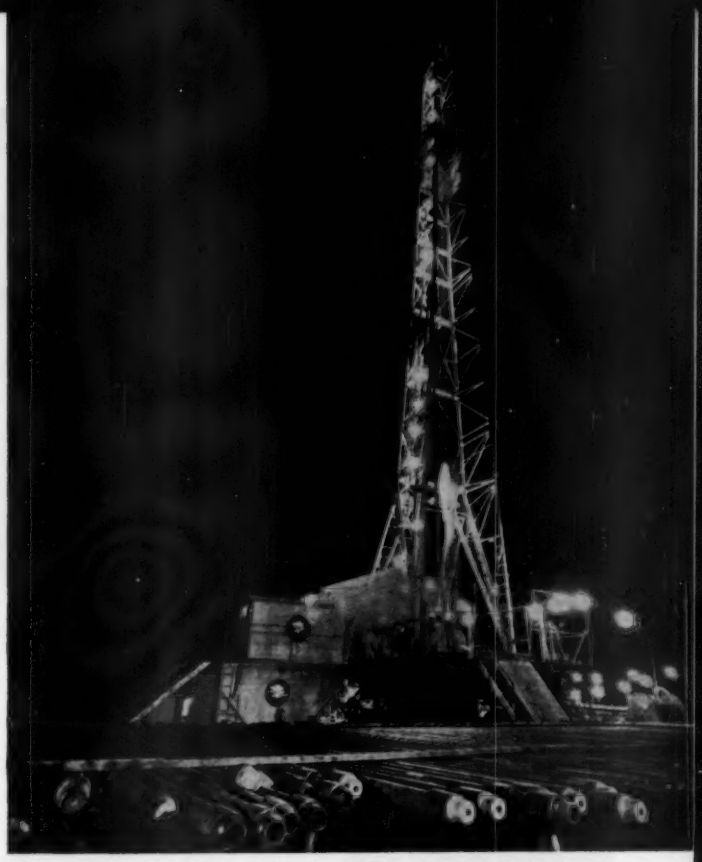
As a case in point, during periods of acute shortage, this distributor set up a service called the Mid-Continent Pipe Exchange. As a free service to the industry, oilmen were polled for tubular material which they wished to swap for goods more strategically located, or more suited to their needs.

This extra service by Pittsburgh distributors is matched by the extra stamina you always get in Pittsburgh Seamless Drill Pipe—a stamina which stems from long experience in making special steels for the special jobs in the oil country.

When you buy your next string of drill pipe, or when you're ready to run casing or tubing, remember the combination of Pittsburgh Steel Co. and independent distributors offers you the kind of service—plus the utmost in dependable seamless tubular goods—that isn't available any other place.

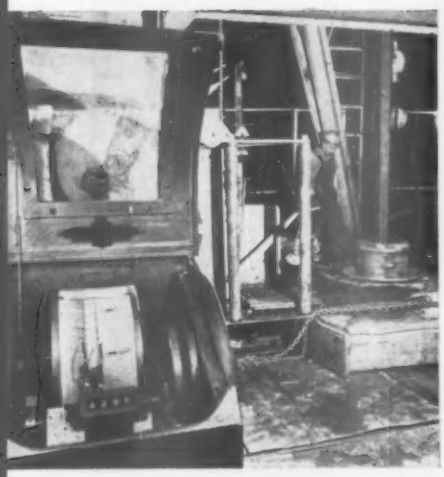
It's easy to get lined up with an independent. They're listed at right. Call the nearest one today for quality seamless tubular products.

LOOKING DOWN—On monkey board of 131-foot, A-mast rig, roughneck gets joint of Pittsburgh Steel Co. drill pipe ready for re-entry during a trip. The 9,500 feet of drill pipe shown at top and on racks below was used to drill three previous wells.



Falcon Seaboard Drilling Co.'s No. 35 rig is at work here on a Sunray Mid-Continent lease near Maysville, Okla.

Driller Oliver Clark, left, chats with Max Thomas, distributor's representative, and Jewel Smith, Pittsburgh Steel field engineer.



Geolograph on same rig shows hole is at 4,296 feet with the rotary table, seen at right, operating smoothly. Geolograph chart indicates driller is midway between joint connections.

Distributor Home Offices

Bennett Supply Company Midland, Texas
Atlas Bradford Company Houston, Texas
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C. W. Cotton Supply Company Tulsa 5, Oklahoma
Franklin Supply Company Denver 10, Colorado
Houston Oil Field Material Co. Houston, Texas
Industrial Supply Company Wichita Falls, Texas
Iverson Supply Company Tulsa, Oklahoma
Longhorn Supply Co., Inc. Houston 14, Texas
Lucey Export Corporation New York 7, New York
Lucey Products Corporation Tulsa 19, Oklahoma
McJunkin Corporation Charleston 22, West Virginia
Midland Supply Company Wichita 7, Kansas
Mountain Iron & Supply Co. Wichita 2, Kansas
The Producers Supply & Tool Co. Fort Worth 2, Texas
Production & Refining Equipment Company Odessa, Texas
Sandy Supply Company Wooster, Ohio
Southwest Supply Company Pittsburgh, Pennsylvania
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Tex-Tube, Inc. Houston 7, Texas
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A $3 billion organization with 285 branches covering the oil provinces alone, Canada's First Bank is uniquely equipped to assist your Canadian oil or gas operation.
* "A Guide for Oil & Gas Operators in Canada", 40-page handbook published by the B of M, is yours for the asking. Address John A. Baines, Mgr., Oil & Gas Dept., 140 Eighth Ave. West, Calgary, Alta., Canada—or our nearest U. S. office.

Report from Beirut

Rift Widens Between Nations, Firms

LISTENING was simplified by simultaneous translation of the Arabic speeches into English.

SPEAKING is M. E. Hubbard, of British Petroleum, who opposed the producers' "cartel."

RECEIVING are Venezuela's Dr. Juan Pablo Perez Alfonzo and Dr. A. C. Briceno. At right is F. Mazidi, new director of Kuwait Oil Co., Ltd.

• Arabs want more voice in running oil affairs, more income from its operations. At Beirut, the producing countries set the stage for action in January.

Paul Swain
International Editor

WESTERN oil men left the Second Arab Oil Congress in Beirut last week a little dazed, somewhat relieved that the pummeling they took wasn't worse, and convinced that the chasm between the more vocal Arabic elements and Western oil companies is widening.

"It's pretty obvious from some of the incredible things that have been said here, that we're not getting through to these people," one American company representative said in summing up.

The Arab position, voiced by Shaikh Abdullah Tariki almost constantly at Cairo last year, at every opportunity in the past year, and at Beirut this year, is obviously aimed at a constant erosion of the oil company position in the world's most prolific oil-producing area.

It can be pretty well epitomized by the word "more."

The Arabs want more income from their oil, more control over private company operations, more Arabs engaged in oil operations, and—most of all—more control over the prices paid by consumers for Arabic oil.

There is no question that Tariki, as head of Saudi Arabia's government oil agency, is the leading antagonist of the West. Most of the other Arabic representatives remained silent and listened with interest as the Western companies tried, usually in vain, to counter the Tariki arguments.

The blue-ribbon Venezuelan delegation, made up of Venezuelans of ambassadorial rank for the most part, took little part in the proceedings except as listeners.

Dr. Juan Pablo Perez Alfonzo, head of Venezuela's Ministry of Mines and Hydrocarbons, was not even present at the more heated discussions. He left for Caracas 2 days before the congress ended.

It was pretty obvious that Tariki was the needler at Beirut and Perez Alfonzo an only casually interested observer. Both are just as obviously setting their sights on the January 15 Caracas meeting of the Organization of Petroleum Exporting Countries, when both expect to form a cooperative group that can make its weight felt.

This was apparent in the final resolutions of the congress, sponsored by the Arab League, and heavily weighted by nonproducing Arab countries. The congress ignored the Tariki-Perez Alfonzo dream of some sort of international proration of oil. This was left for OPEC to struggle with.

Only two of the final four resolutions of the congress were directed stingingly at the western companies. The other two were more or less concerned with the internal business of the congress.

The last resolution set a regular date of the third Monday in October for future congresses The next will be in Cairo.

The resolutions . . . Among the resolutions were these:

. . . Demands for improvement in concession terms throughout the Middle East were officially "upheld" by the congress.

As the resolution read, the heads of delegations from the Arab countries "express their hope that the companies will respond favorably to such equitable demands to insure the continuation of fruitful cooperation . . ."

. . . A flat "disavowal" of the recent reduction in posted prices of crude and products without the consent of the governments of Arab producing countries.

"Also the congress upholds the position of the governments in their repudiation of such reductions."

. . . A recommendation to their own governments to "double their efforts for the encouragement of technical, economic, and legal studies, and for making available to the sons of Arab

countries their participation in the activities of petroleum congresses."

Tariki's needling . . . Three of the four controversial elements in the entire congress came straight from the department of technical and legal people which Tariki has built in Saudi Arabia.

The most controversial was his own pricing paper which includes a rigid formula for oil prices and a claim that the oil companies have made $5.5 billion in hidden profits over the past 7 years in transportation charges.

The second firebrand was a further exposition of an argument by Frank Hendryx, American lawyer employed by Tariki, that any sovereign country may at any time completely abrogate or ignore a contract if such an action is in the best interests of its people.

This thesis, first propounded by Hendryx at Cairo, almost caused an explosion at the First Oil Congress. The Beirut paper was just a little more of the same, in a vein more philosophical than legalistic. The thesis itself has the effect of sharply increasing the blood pressure of any western lawyers in an audience, but at Beirut it was dismissed by westerners pretty largely as "nonsense."

The third controversial issue from the Tariki camp was the proposal for some form of international proration to solve the problems of over-supply and attendant weak oil prices. This was delivered by Matt J. Sladic, American petroleum engineer.

It was this proposal which the Congress ignored officially in its resolutions. It will undoubtedly be raised at the future meetings of OPEC.

The congress almost took on a United Nations air in the wide diversity of interests and nationality of those who attended. All delegations from western European and American oil companies were larger at Beirut than at Cairo last year.

In addition there were delegations from Mexico, Brazil, Argentina, and Venezuela to represent Latin America. The Far East was well represented by sizable delegations.

Beyond that point, the interest and geographical character of the delegations to this "Arab" Congress almost defy analysis. There were Swedes, Germans, Italians, South Africans, Algerians, Turks, Russians, Yugoslavians, and Czechoslovakians.

All in all, the Second Congress was a much bigger, better-organized show than the first. It covered pretty much the same ground from the standpoint of Arab grievances.

Foreign Prices Phony?

• Tariki stirs a howl of protest with his claim that big companies pocketed $5.5 billion in hidden profits. The consensus: Needling is just stage setting for January.

THE SINGLE paper presented at the Second Arab Oil Congress which provoked the most fire and which was attacked with all the artillery barrages the Western companies could muster was one on prices by Shaikh Abdullah Tariki of Saudi Arabia.

Almost without exception, the western company representatives tried to refute the Saudi Arab's arguments and convince everyone listening that Tariki's thesis of $5.5 billion in hidden profits does not exist.

If the Westerners succeeded in swaying the opinion of Tariki's Arab audience, they certainly made not one dent in his own views.

"They can talk from now on," he commented privately, "but they'll never convince me that I'm wrong.

"The Americans have always lied to us.

"They treat us like children—well, we are no longer children."

Tariki's paper, along with the non sequiturs in his conclusions, was a long and detailed history of crude-oil prices at various pricing points through-out the world for the past 20 years and more. It was loaded with statistics and figures from a number of sources—all of them reliable.

His whole thesis was only a foundation for his current theory that in the period from January 8, 1953 to August 8, 1960, the companies which operate in the Middle East made the hidden profits by applying a phony set of freight rates in arriving at posted prices.

Tariki insisted that since July 1949, Middle East oil's posted prices have been computed by the controlling companies so that it could be laid down in New York, freight included, at a price that would equal the cost of Venezuelan oil, plus freight, at the same port.

"It would be assumed, therefore, that the United States was the major market for Middle East oil, but in fact it accounts for only 8% of Middle East production as compared to 55% imported into western Europe," he said.

"It is only logical that the pricing of Middle East oil should be related to western Europe as its major market with London being considered the point of equalization."

He contended further that the Middle East posted price should be set by the following formula:

Posted price is equal to the Gulf

Aramco's Brougham Counters: There

TARIKI becomes a listener . . .

SOME of the harshest language heard at the Arab Oil Congress was applied with a kind of "I'm saying this with a smile" attitude by an Arabian American Oil Co. vice president in reply to Shaikh Abdullah Tariki's pricing paper.

R. I. (Bob) Brougham, Aramco vice president, termed "preposterous" Tariki's reference to billions in hidden profits.

"He says that since January 1953 the companies gained $5.5 billion in the form of increased profits in which the governments did not share. How does he reach this fantastic figure?" Brougham asked.

Brougham said Tariki tried to apply a formula to explain how prices are set.

"His formula doesn't work—as

HIDDEN PROFITS, Tariki charged, totaled $5.5 billion, came from using a "phony" set of freight rates in setting posted prices.

of Mexico price for similar crudes, plus actual transportation costs, from the Gulf to London, minus actual transportation costs, Middle East to London.

His contention that the companies have pocketed the phantom $5 billion-plus in hidden profits hinges on his theory that these freight formulas are based on a New York shipping point rather than the proper one of London.

Reaction . . . The reaction of the Westerners was immediate, just as Tariki intended.

The phrase "prices are set in the market place and not by formula" threaded almost every comment made by a western company representative.

Tariki's response was something like this:

"We need a formula to protect ourselves. When we want to discuss posted prices, the companies refuse. We want to be convinced the companies are working for us, and not for their parents."

When reminded that U. S. antitrust laws would prohibit any discussion of price changes before they go up or down, Tariki snorted in derision.

"What interest do we in Saudi Arabia have in U. S. laws? These companies are operating for us in our country. Do we have to accept the laws of their home country as well as them?

"This is one reason why we want them divorced from their parents."

George Ballou, of Standard Oil of California, an old friend of Tariki but his antagonist on this point, had earlier delivered a paper stressing the competitive elements in today's oil market and the resistance which consumer countries are building to higher prices for Middle East—or any other—oil.

"This business of profit from freight doesn't make sense," Ballou said more than once. "If there was profit in freight, no oil company could afford to run tankers. Every customer of ours would have his own ships."

J. E. Anderson, British Petroleum in London, added his opposition to Tariki in this way:

"The whole argument of the paper infers a degree of mathematical precision and rigidity in price determination which is altogether impractical and at variance with the economic facts of life."

He added that he was tempted to suggest that Tariki rework his calculations on the basis of Venezuela oil being discounted at 50 cents, 80 cents, and even $1 a barrel "as has been the case in recent years."

If this were done, the BP man suggested, another mythical amount would appear, showing that the producing countries should pay back to the oil companies one-half of "I do not know" how many billions of dollars.

Other Tariki points . . . At the conclusion of his paper, Tariki listed three steps which he thinks the oil companies should take to minimuze "mistakes" and improve relations with the Arab countries.

He listed them as:

. . . Separation of producing companies from ownership by parent companies.

Tariki suggested that the parent-company interest in a middle eastern producing company be sold to the parent-company stockholders.

. . . Location of the board of directors in the producing country with board membership representing the shareholders and the country alike.

. . . Trade deals on a contractual basis should be made between parent companies and the producing companies for the sale of crude and products to avoid disturbance in market conditions.

Are No Such Hidden-Profit Figures

shown by his own figures—because he always ends up with differences ranging between 6 cents and 60 cents per barrel," Brougham continued.

"Unwilling to admit that his theoretical calculations are not supported by the actual facts, he does a very surprising thing. He asserts that his calculated prices are the 'correct' ones and that oil-company posted prices represent hidden discounts off the prices in fact."

Brougham argued that "the hidden profits which the author imagined to make his theory work do not exist, and never existed."

Tariki replied, in part:

"The figures I mentioned, Mr. Brougham is not supposed to know. He is working for Aramco. These figures are made by the parent companies."

. . . as Brougham offers a rebuttal.

EARPHONES allow delegates to get simultaneous translation of Russian statement being read in Arabic . . .

Say the Russians: We'll Take More of

The Russians served notice on Arabs and the West alike that they are in the world oil market to stay and implied they intend to grab an even bigger share of an already distressed market for themselves.

The Russians did not close the door to any future cooperation with Arab and Latin American producing countries in some form of international proration. But the implication left in Beirut was that the Russians expect to name their own share of the market or they won't play.

The Soviets injected themselves into the oil discussions in what was easily the most dramatic session of a Second Arab Petroleum Congress that had other tense moments.

Shaikh Abdullah Tariki of Saudi Arabia had just summarized his controversial paper accusing western companies of making unfair profits of $5.5 billion dollars in the Middle East in the past 7 years. R. I. Brougham, Aramco vice president, took the floor briefly to dispute the entire paper.

Before Tariki could reply, two Russians rose from their seats, stalked to the front of the big UNESCO auditorium and, ignoring the session chairman, grabbed the floor microphone.

"I am Gourov, chairman of Sojuznefteexport," boomed the bulging, bespectacled leader of the pair in English.

Then he stepped smartly about three paces away from the microphone. While he waited stolidly, almost at parade rest, the younger Russian, Vladimir Shvanoff, stepped forward and began to read in Arabic from a long prepared statement. Western delegates and observers scrambled for earphones to hear the translation.

The statement was prefaced by a polite "thank you" to the officials of the congress "for an opportunity to take part" in the congress.

Arab officials of the congress had already somewhat cautiously and privately admitted that the Soviet delegation was there because they had asked to be allowed to come.

Gourov's statement noted that he did not intend to take issue with what he called a number of biased and untrue statements which had already been made at the congress. He mentioned specifically a paper written by Theodore Shabad, whom he described as the "so-called specialist in Russian affairs in Paris," and remarks made on the floor by Emile Bustani, ebullient Lebanese politician and wealthy Middle East contractor.

Next Gourov launched into the meat of his statement, which reviewed very briefly Russian history in regard to world oil and denied vigorously that the Soviet is dumping oil in today's market or is undercutting the price structure.

In part, the Gourov statement was the most concise statement of the case western oil company representatives had been trying for 2 days to sell Arabs indignant over the recent crude price cuts.

The Russian position . . . Gourov contended that the Soviet position in today's market is but a pale shadow of what it once was.

He pointed out that in the 1925-35 decade, western Europe imported 210 million tons of oil and oil products (an average of about 42,000 bbl. daily for the period). He said the Russians furnished 14.3% of that oil. He added that in the 1930-33 period, the Soviet share of these imports rose to an average of 19% and the Russian share of western Europe's oil in the entire period from 1922 to 1940 ranged from a low of 14% to as much as 30%.

In contrast to these figures, he said, the 24 million tons of crude and products which the Soviet exported to "capitalist" countries in the 1956-59 period (an average over the 4 years of 120,000 bbl. daily) represented only 4.4% of the total imports of 540 million tons.

"It is absolutely obvious that no flood of the western market with Soviet crude oil takes place," he said.

Gourov conceded that USSR exports of oil to the West increased from 3.5 million tons (70,000 bbl. daily) in 1954 to 14 million tons (280,000 bbl. daily) in 1959, but pointed out that this was only 10.8% of the Soviet output of 129 million tons of oil (2,580,000 bbl. daily) last year.

"We do not encroach upon the market to the detriment of the historical positions of other suppliers," Gourov said. "We are only renewing our legal place among the exporting countries

. . . by aide to E. P. Gourov (right), who waited stiffly while having his say.

the Market, Please

which belonged to us in the prewar years and which was forfeited by us owing to conditions of wartime as well as the necessity of reestablishing home industry immediately after the war.

"We are sure that the Arabian countries have no reasons to fear for the fate of their exports not only to western Europe, but also to other countries, especially as the world consumption of crude oil is growing from year to year."

Gourov on prices . . . The Russian trade agency chairman rejected flatly some of the facts already accepted by every one of the 600 oil men listening to him.

"The prices at which Sojuznefteexport is now selling crude oil and petroleum products completely correspond to the price level of the present petroleum market.

"It is necessary to keep in mind that for the time being there is no common price, like there is no common world petroleum market."

Then Gourov commented that today there are actually two oil markets in the world—one "monopolized" and "controlled" by eight international companies, and another "non-monopolized" market in which "dozens" of independents are competing.

His next statement sounded as if a western company man were speaking.

"The prices form in the process of the acute competition and on their basis are transactions concluded," the Russian said.

Gourov pointed out that if a new seller appears in a "free market," naturally he must operate under existing market conditions.

"Sojuznefteexport, who is one of the major independent sellers, also has to keep to these conditions and sell its goods at the prices of the free market," he said.

Gourov did not comment on a previous remark by Dr. W. Nuttal of Shell International, who quoted from press reports of a recent deal made by the Italian state company, Ente Nazionale Idrocarburi, with the Russians.

Dr. Nuttal pointed out that ENI was the largest single western European purchaser of Russian oil last year and planned to buy 2.5 million tons of crude (50,000 bbl. daily) and 650,000 tons of fuel oil (13,500 bbl. daily) in 1960.

"On October 16," Dr. Nuttal said, "Mr. Mattei, head of the ENI, is reported in the Italian press to have made the following statement:

" 'Soviet oil will not involve royalties of any kind, unlike the Middle East deals. This will constitute a saving of about half the cost over transportation from the Persian Gulf and in general from the Middle East. The Russian petroleum is basically the same as that of Kuwait.' "

"Mr. chairman," Dr. Nuttal concluded, "assuming Mr. Mattei's statement is correct, it is not surprising that the Russian oil can undersell Middle East oil."

Dr. E. Bonouri, a member of the ENI delegation, later made a statement defending the ENI purchases. He said Russian oil makes up "only a part" of ENI's needs and "an even lesser part of Italy's total requirements."

When the two Russians resumed their seats amid scattered applause, Tariki resumed his comments as if the Russians had never appeared.

"As I was saying," the Saudi oil chief continued, "Mr. Brougham and I have been friends for many years, but about all we agree on is horses."

Then, at an obvious signal from Tariki, the session chairman adjourned the meeting rather than let it degenerate into a political hassle. It wasn't until the following day that discussion on Tariki's paper was resumed.

Bustani May Have Triggered Soviet Remarks

LEBANESE Emile Bustani, self-appointed critic of both the Russians and Italians at Beirut, may have sparked the Russian statement in a volatile exchange with E. P. Gourov at a social function the evening before.

The discussion got so heated that the Russian head of Sojuznefteexport shook his finger in Bustani's face and quivering with anger warned: "Don't try to dictate to Soviet Russia."

The following day, Bustani took the floor at an open session of the congress and warned the Russians against any "attempt to dictate to the Arab world."

U.S. Demand Gain of 2.3% Seen in '61

- **Crude-oil output should rise 2.7% to 8,247,000 bbl. daily, IPAA concludes.**

- **This year's demand gain is set at only 2.4% over 1959 in revised estimate.**

DOMESTIC DEMAND for oil will move upward again next year. But the amount of increase will not set off any wild celebrating by U. S. producers.

The supply-demand committee of the Independent Petroleum Association of America predicted last week that domestic demand for oil products in 1961 will average 9,900,000 bbl. daily.

And, estimated exports of 198,000 bbl. daily will boost total demand for products to 10,098.000 bbl. daily.

The 1961 domestic-demand estimate compares with IPAA's new estimate for 1960 of 9,677,000 bbl. daily and would represent a gain of about 2.3%.

The small gain is even less impressive in view of IPAA's revised estimate for 1960, which pared about 50,000 bbl. daily off its 1960 demand forecast made last spring. As revised, IPAA now estimates a demand gain this year of about 2.4% over 1959.

Crude situation better . . . Total crude demand in 1961, IPAA says, should run about 8,247,000 bbl. daily—roughly 143,000 bbl. daily more than in 1960.

Part of the 1960 demand was filled, however, by a draft on inventories. Assuming no change in crude stocks next year, the association predicts new supply of crude oil would match demand and would exceed the 1960 new supply by 210,000 bbl. daily.

Domestic crude production should increase by 188,000 bbl. daily or about 2.7% next year to average 7,202,000 bbl daily

IPAA forecasts crude production by quarters to average 7,189,000 bbl. in the first, 7,094,000 bbl. in the second, 7,147,000 bbl. in the third, and 7,370,000 bbl. daily in the fourth quarter next year.

Refinery demand for crude next year should total about 8,240,000 bbl., the committee predicts.

Exports of 7,000 bbl. daily—down from 9,000 bbl. daily in 1960—would boost crude demand to 8,247,000 bbl.

How IPAA Sees Supply and Demand in 1961

(Thousands of barrels daily, except closing stocks)

	1960			1961				
	3rd Q*	4th Q	Year	1st Q	2nd Q	3rd Q	4th Q	Year
Domestic Demand								
Gasoline	4,378	4,060	4,138	3,805	4,450	4,485	4,170	4,228
Kerosine	278	450	361	525	250	290	495	390
Distillate	1,196	2,180	1,865	2,745	1,405	1,240	2,250	1,910
Residual	1,183	1,600	1,530	1,900	1,340	1,210	1,605	1,514
Other	1,849	1,860	1,783	1,735	1,800	1,985	1,910	1,858
Total	8,884	10,150	9,677	10,710	9,245	9,210	10,430	9,900
Exports								
Gasoline	36	40	40	35	42	42	40	40
Kerosine	4	2	2	2	2	2	2	2
Distillate	28	35	32	32	32	32	32	32
Residual	43	45	50	55	53	50	50	52
Other	85	78	82	72	77	72	72	72
Total	196	200	206	196	206	198	196	198
Total Demand	9,080	10,350	9,883	10,906	9,451	9,408	10,626	10,098
Stock Change	+411	−586	−125	−700	+406	+412	−327	−49
New Supply Required	9,491	9,764	9,758	10,206	9,857	9,820	10,299	10,049
IMPORTS								
Crude			1,023					†1,045
Products			788					†825
Total			1,811					1,870
Production								
Crude	6,921	7,000	7,014	7,189	7,094	7,147	7,370	7,202
Gas liquids			933					977
Total			7,947					8,179
Closing Stocks (Million Bbl.)								
Gasoline	187.4	189.2	189.2	212.0	192.0	170.0	183.0	183.0
Kerosine	35.2	26.8	26.8	18.0	26.0	34.0	27.0	27.0
Distillate	168.6	140.2	140.2	72.0	102.0	158.0	133.0	133.0
Residual	50.3	41.7	41.7	36.0	39.0	44.0	40.0	40.0
Other Products & Natural Gas Liquids	144.0	133.0	133.0	130.0	146.0	137.0	130.0	130.0
Crude Oil	231.9	232.5	232.5	232.5	232.5	232.5	232.5	232.5
Total	817.4	763.4	763.4	700.5	737.5	775.5	745.5	745.5
Runs to stills	8,198	7,985	8,070	8,162	8,132	8,165	8,393	8,215

*Estimate based on U. S. Bureau of Mines and API figures. †Based on import program now in effect.

The committee estimated 1961 imports on the basis of standards of the import program now in effect, since the Interior Department has not announced quotas for the first half of 1961. Crude imports are estimated for the year at 1,045,000 bbl. daily, leaving 7,202,000 bbl. daily for domestic producers.

Gas liquids up . . . Natural-gas liquids, the committee estimates, will cut further into domestic crude markets next year—as will product imports.

The committee forecasts liquids output at an average daily rate in 1961 of 977,000 bbl., 44,000 bbl. daily or 4.7% above the 1960 average.

Imports of products will increase to about 825,000 bbl. daily from an average 788,000 bbl. daily in 1960, the committee thinks. The gain would approximate 37,000 bbl. daily or again about 4.7%.

The committee was headed by N. G. Dumbros and included R. A. Hendricks, Melvin L. Mesnard, Vincent M. Brown, C. V. Horky, Serge B. Jurenev, Edward Symonds, John G. Winger, Robert O. Law, James S. Cross, F. M. Carlson, John E. Hodges, Joe Hall, Edward R. Heydinger, H. M. Ryan, Henry G. Corey, Jr., and Isaac C. Kerridge.

NATURAL GAS PANEL members at IPAA meeting were, from left, W. J. Goldston, W. M. Elmer, and J. Theodore Wolfe.

Gas Curbs Here to Stay, IPAA Told

• Chances are nil for escaping all regulation of producer prices, spokesmen for pipelines and distributors say. Legislation easing federal control will have a chance if it stabilizes prices at city gates.

INDEPENDENT gas producers, seeking a way out from oppressive federal regulation, were told bluntly by spokesmen for pipelines and distributors at the IPAA meeting that:

... **There is no chance** of legislation completely freeing producer prices from all control.

... **Any new form** of regulation must be satisfactory to distributors because they are the ones who must sell it to customers and state utility commissions.

... **To have a chance** of success the new method must stabilize gas prices at city gates—not freeze them but make them reasonably predictable.

... **The new area-pricing** approach adopted by the Federal Power Commission is a big step in the right direction and holds the possibility of becoming the basis for a form of regulation that will be generally acceptable.

Producers however, were not thoroughly converted by this missionary work on the part of W. M. Elmer, president of Texas Gas Transmission Corp., and J. Theodore Wolfe, president of Baltimore Gas & Electric Co.

A resolution adopted by IPAA studiously avoided any mention of FPC's area approach. Neither did it suggest any compromise with the objective of completely freeing field prices from all regulation. The resolution simply complimented FPC for finally agreeing that utility-type controls are not workable, and directed IPAA officers to continue to work with other segments of the industry in a joint effort to obtain new legislation.

The harmony group . . . It was a result of this joint effort that the pipeline and distributor spokesmen appeared at the producer's meeting.

Both Elmer and Wolfe are members of a so-called "harmony task force" which for the past year or more has been attempting to get better understanding among the three segments of the gas industry with a view to agreement on new legislation.

On the same platform with them was a producer delegate to this harmony group, W. J. Goldston of Goldston Oil Corp., president of Mid-Continent Oil and Gas Association.

All three reported that this group has made much progress in mutual understanding of each others' problems. Some general objectives for new legislation have been agreed upon. But not even a tentative draft of an acceptable bill has yet been framed by the group.

Goldston said that the work of the harmony group holds out very real promise for a solution which will be fair and equitable to producers, pipelines, distributors, and consumers.

But the most he could say in favor of FPC's new policy was that if the commission intends to consider cost trends, such as well depths and labor cost trends, this would seem to be

reasonable and there is much to be said for such an approach.

On the other hand, Goldston pointed out, the policy does not cover all problems of producers and leaves many questions unanswered in what it attempts to cover. Methods and procedures are still to be worked out and these could easily become so cumbersome and complicated as to be ineffective, and the policy rests on administrative action which could be reversed or switched at any time.

Therefore, he said, the need for new law is even more imperative, and he warned against letting the new policy slow down efforts for congressional action.

The pipeline viewpoint . . . Elmer said producers cannot be regulated as utilities, that field prices must be high enough to give producers an incentive to develop new supplies for interstate markets, but that there must be some mechanics for stabilizing the price of gas to consumers.

If consumer prices keep going up as fast as they have in recent years, Elmer warned, "the political pressure will become so great that we can all forget about legislative relief and, instead, look to more and more restrictive legislation upon the production, transmission, and distribution segments of our industry."

Transmission companies all realize that the cost of developing new gas reserves is increasing and will continue to increase, and also that these costs must be covered if there are to be new supplies. But, he said, it is getting more and more difficult for pipelines to pass these costs on to their customers. So the only realistic approach is one that promises to put some stability into the price structure.

The area-pricing approach now taken by FPC is one which always has appealed to transmission men as offering the most promise of being workable, Elmer said. If it proves to be reasonable in application, then everybody in the industry will be able to know what to expect, which is what all are seeking.

Elmer said he does not endorse the very low ceiling prices set by FPC, the differentials between prices for new and old gas, and boundaries of the areas, nor the price differences between them. But he pointed out that FPC made these decisions on the basis of information it had at hand, and practically all of this information came from the FPC staff which is way out in left field remote from practical industry problems.

If producers had given FPC better evidence on area prices they might have been better qualified with the results, he said. And the job facing producers now is to develop and present the kind of information FPC must have to make the new policy workable.

A bill that takes care of producers without recognizing the problems of pipelines and distributors has no chance at all of being passed, Elmer said.

Consumer prices . . . Most distributors, according to Wolfe, now realize that a big problem of the entire industry is maintaining adequate supplies of gas. But they realize that an equally big problem is that of selling gas in the face of increasing competition.

He warned that if consumer prices continue to rise at their recent rates, whether because of higher field prices or for other reasons, much of the market will be lost and growth will stop.

Distributors cannot support legislation completely freeing field prices from all control Wolfe explained, for these reasons:

. . . They must make long-term contracts to purchase large quantities of gas with no knowledge of what the price is going to be.

. . . They cannot participate directly in negotiating field prices.

. . . The rapid rise in city-gate prices during the past 10 years and the frequency with which distributors have been faced with making upward revisions in their prices have brought tremendous resistance from consumers and from state and city regulatory commissions.

. . . Many factors have caused the increase in consumer prices but the

Interior Would Brake Oil

THREE-STEP action to tighten oil import controls was proposed last week by the Department of Interior.

The proposals, if adopted, could result in quotas totaling about 60,000 bbl. daily less during the next 6-month allocation period than the quotas would be if the old formula were followed, Interior officials estimated.

This does not mean, however, that quotas for the first 6 months of 1961 will be 60,000 bbl. daily less than in the current period.

For one thing, the Bureau of Mines' demand estimates, on which quotas are based, undoubtedly will be higher for the first half of 1961 than for the last half of 1960.

That factor, together with others, could mean that individual import quotas for the next allocation period will be about the same as they are at present.

The point emphasized by Interior, however, is that under its proposed changes, the quotas for the next 6-month period will not be as high as they otherwise would have been.

The three proposed steps would reduce the import level of crude oil, unfinished oils, and finished products in Districts 1-4 by:

. . . Thirty per cent of the amount by which residual fuel imports in the January-June 1960 period exceeded the corresponding 1957 level.

. . . The amount by which shipments of crude oil, unfinished oils, and finished products shipped from the West Coast (District 5) into Districts 1-4 in the January-June 1960 allocation period exceeded such shipments during the corresponding period of 1958.

. . . Nine per cent of the amount by which estimated total demand in the preceding allocation period fell short of, or exceeded, actual total demand during the period.

Applying the above formulas gives the following results:

Residual fuel shipments in the first half of this year averaged 490,000 bbl. daily, compared to 385,000 bbl. daily in the first half of 1957. Thus, 30% of the difference between the two totals would mean a cut of 31,500 bbl. daily in quotas for the first half of 1961.

Shipments of crude, unfinished oils and products from District 5 into Districts 1-4 in the first half of this year were 13,000 bbl. daily higher than in the first half of 1958. Thus 13,000 would be deducted from the 1961 quota.

Actual demand in the first half of 1960 fell 160,000 bbl. daily short of the demand estimated for that period by the Bureau of Mines. Applying the 9% factor to that 160,000 bbl. would mean another 14,400 bbl. daily to be deducted from first-half quotas.

Adding the three reductions—31,500, 13,000, and 14,400—gives a possible total of 58,900 bbl. daily as the difference in quota determined by the proposed system and the one that has been in effect in determining past import quotas.

Under Secretary Elmer Bennett emphasized that the proposed new plan, to become effective, would require an amendment to the presidential proclamation concerning the import

Imports in '61

control program. Such a presidential announcement was expected soon.

Furthermore, the proposal gives the industry until November 14, to voice objections, suggest changes or express approval of the new plan.

More cuts wanted . . . The first reaction in Washington came from Minor Jameson, executive vice president of the Independent Petroleum Association of America.

Jameson said that although he had not had an opportunity to study the proposal, he felt that producers generally would applaud the fact that the Government "has recognized the need for a further reduction in import levels."

He pointed out that the proposals made by Interior carry out part of the suggestions made by the IPAA in its recent Dallas meeting. However, he said, IPAA had also suggested other moves to tighten the control program.

One of these proposals would deduct from the quota base all imports from Canada, although it would let the exemption of Canadian shipments remain.

Also, IPAA recommended that the military be required to purchase its domestic fuel needs in the U. S., and it recommended that "historic" allocations for import quotas be eliminated.

Jameson indicated that IPAA would continue to press for these suggested restrictions even if the reductions already proposed by Interior are put into effect.

Cut Doesn't Surprise Producers

THE GOVERNMENT'S reduction in imports confirmed corridor speculation at last week's IPAA meeting that a cut was coming soon.

About the only thing that had been in doubt was the timing of the reduction. Some of the IPAA men had figured the word might come from Elmer F. Bennett, Under Secretary of the Interior, in an address to the West Central Texas Oil and Gas Association in Abilene, Tex., November 3.

Delegates didn't get anything from government officials participating in the IPAA program before the announcement was made in Washington. One of these officials was Lawrence J. O'Connor, Jr., oil import administrator for the Interior Department, shown above as he took part in a panel discussion on "Oil, Government Policy, and the National Defense."

Other government officials closely connected with import-control machinery who had a role in the panel discussion were Roy J. Price, assistant director of the Office of Civil and Defense Mobilization, and Clarence W. Nichols, special assistant in the State Department.

O'Connor maintained that oil imports were not mounting as a per cent of demand, but that Interior nevertheless recognized domestic crude-oil production "has not increased in the same relationship as imports since 1954." He also hinted the administration was not greatly pleased with plans to import large volumes of Canadian gas liquids into the U. S.

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most obvious is the increase in field prices, and an apparently small increase in field prices becomes multiplied into a disproportionate effect on prices at the consumer's burner tip.

Many state utilities commissions have served notice that they will not approve higher rates for distributors unless the distributors can prove that they have made every possible effort to resist increases in the cost of gas to them.

If oil and gas prices are allowed to equate on a BTU basis at the wellhead, the economics of the gas industry are such that gas cannot come anywhere near competing with oil and other fuels at distant consumer points, with the result that both distributors and interstate pipelines will go out of business, Wolfe said.

Therefore, distributors will insist on some supervision of gas prices wherever there is not free play of competition in the market place. And while producers may be right in saying that there is free competition at the production end, Wolfe said this is not true by the time the gas gets to city gates and therefore regulation must continue.

But Wolfe had some words of encouragement. Practically all distributors, he said, are now ready to agree that producers are not utilities and that the rate-base formula is not a satisfactory method of determining fair prices in the field.

A big majority of distributors are willing to free individual producers from regulation so long as there is some governmental machinery for protecting distributors' interests.

A great many distributors are not yet convinced that legislation is needed. Many still feel that FPC and the courts can work out a satisfactory solution.

If there is ever to be new legislation, Wolfe said, it must have the widespread support of all segments of the industry, and particularly of the distributors because they must be the No. 1 salesmen in overcoming the opposition of state utility commissions.

It is just as unrealistic to look to complete freedom of field prices as it is to try to regulate field prices on a cost-of-service formula, Wolfe declared. The solution must be something in between.

So, Wolfe concluded, the entire industry should take the view that FPC may be pointing the way to a satisfactory solution and should help it along by patience and statesmanship.

FPC Sets Two More Area Prices

. . . covering new natural-gas sales in Mississippi and in southern Louisiana. Action on these areas was delayed.

THE Federal Power Commission has set area prices for new natural-gas sales in southern Louisiana and for all of Mississippi.

The price for each area is 20.96 cents for pressure of 14.65 psi. and 21.5 cents at 15.025 psia.

When the FPC set prices for other areas in its September 28 policy announcement, it said it was not establishing area prices for southern Louisiana and Mississippi because it had two cases under rehearing as a result of court action The two cases were from those areas.

However, the commission last week decided to establish those area prices now because of "the great number of proposed sales from those areas now involved in certificate proceedings."

The FPC felt that it would be unfair to delay all those applications until after the remanded cases were settled.

It said the large amounts of gas involved in those pending applications were "vitally needed" now.

The FPC took pains to point out that the new area prices will not apply to previously authorized sales—whether or not those sales were at a higher or lower price level than the level now set for the area.

Previous sales, the FPC said, "were the result of our judgment of the situations at the time those cases came before us."

The new announcement, it continued, "is neither a repudiation of our previous decisions nor a prejudgment of the cases presently being reconsidered separately by us upon remand from the Supreme Court."

In other words, the area price will not necessarily be the price eventually set in the C A T C or the Transco cases—the ones the FPC was referring to.

Nevertheless, it appeared obvious that testimony and data presented in those cases carried a great deal of weight with the commission in its establishment of the new area prices.

CATC had been granted a price of 21.4 cents by the FPC. In the Transco cases, the FPC has accepted initial prices of 21.5-22 cents in one and 21.4-22.3 cents in the other. The cases were appealed to the c o u r t s and eventually sent back to the FPC for reconsideration.

The ceiling price for rate hikes under old contracts in southern Louisiana and Mississippi was established in the FPC's September 28 policy statement. In both instances the area price is 13.7 cents (14 cents at 15.025 psia).

Phillips Won't Protest, But Wisconsin Does

PHILLIPS Petroleum Co. last week decided not to file a request for a rehearing of the Phillips case decision handed down by the Federal Power Commission on September 28.

This indicates that Phillips is willing to accept the terms of that historic decision.

It does not mean, however, that the case will not be reheard.

The Utilities Commission of Wisconsin and the State of Wisconsin have already filed objections to the Phillips decision and to the policy statement which accompanied it.

The main point of the protest was that the FPC could not abandon—in view of court decisions—the rate-base method of regulating producers. Under the policy statement, FPC would use an area pricing approach instead of the rate-base method.

Imports Swapping

. . . involves about 40% of current allocations.

THE intercompany exchanges of crude oil under the import control program are continuing at a brisk pace.

Interior Department announced last week that 371,322 bbl. daily of imported crude is being exchanged for domestic crude during the current July-December allocation period. This is almost 40% of total import allocations.

These swaps are generally between inland refiners with import quotas and coastal refiners who are in a better position to utilize the foreign crude. In return the inland refiner receives domestic crude, usually getting better than an even swap.

Interior said it could not determine just how much domestic crude is

FPC Proposes New Producer-Report Rule

THE Federal Power Commission last week issued a proposed rule which would require independent natural-gas producers to file annual statements of their sales and revenues.

Since 1955, FPC has annually asked for such reports, the last covering 1958. The net effect of the rule now proposed, therefore, would be to put the requirement for annual reporting on a permanent basis.

There would be two forms, similar to the ones used in 1957 and 1958. One would be for producers whose sales are less than 2 billion cubic feet per year and the other for sales exceeding that amount. The form for smaller producers requires only limited information.

The FPC said it was continuing the exemption of producers from the comprehensive accounting and reporting required of pipeline companies, but said it needs the minimum data called for in the proposed producer-reporting forms.

Interested parties have until November 14 to submit written views on the proposal.

PROCESSING

Operations have begun at the Carwin Co.'s new $1 million isocyanates plant near Houston. The plant makes 16 different isocyanate compounds from amine and phosgene raw materials in a process that is part batch and part continuous. Isocyanates are used in manufacturing drugs, waterproofing materials, foam padding, and insulation.

A natural-gasoline plant will be constructed by Phillips Petroleum 20 miles north of Stephenville in Erath County, Tex. The plant, expected to be finished by next March, will process 25 million cubic feet of gas daily and produce about 50,000 gal. of natural gas liquids daily. Gas will come from the X-ray field of Erath County and from the Rising Star area of Eastland and Comanche counties.

Damage from an unexplained blast at the Tennessee Eastman Co. plant in Kingsport on October 4 has been

involved in the current exchanges.

In Districts 1-4, 20 oil firms are getting 285,660 bbl. daily of foreign crude in exchange for domestic crude with other companies under 155 exchange agreements.

In District 5, eight companies are getting 85,662 bbl. of crude daily from abroad under 26 exchange agreements.

Among the companies most active in making the exchanges are Atlantic Refining Co., 32,497 bbl. daily, principally Venezuelan Oil; Gulf Oil Corp., 31,539 bbl. daily from Kuwait and Iran; Socony Mobil Oil Co., 33,569 bbl. daily from Kuwait and Venezuela; Standard Oil Co. of California, 31,598 bbl. daily from Saudi Arabia and Venezuela; Standard Oil Co. (N. J.), 31,859 bbl. daily from Venezuela; and Tidewater Oil Co., 31,123 bbl. daily from Venezuela, Saudi Arabia, Kuwait, and the Neutral Zone.

In District 5, Standard Oil Co. of California is swapping domestic crude for 40,685 bbl. daily, chiefly from Sumatra.

Originally, the assignment of import quotas to inland refiners who had no history of imports brought squawks from established importers who argued that this constituted a windfall for inland refiners.

However, independent refiners insist they must have some means of offsetting the difference in cost between foreign and domestic crudes. Otherwise, they say, they would be forced out of business.

Price on Trading Stamps Ordered

TRADING stamps are taking a licking in California.

Atty. Gen. Stanley Mosk, in clarifying a July opinion, has ruled trading stamps are a discount and must be given a value on the gasoline pump. The ruling also covers glassware and other items given with gasoline purchases.

The ruling covers only gasoline sales and has no bearing on stamps given with groceries or other commodities. Mosk bases his ruling on the state's gasoline advertising laws.

Oil-company reaction to the ruling is divided. Some companies would like to see trading stamps outlawed since they feel they are an added expense they could do without. Others support trading stamps, feeling it gives their dealers something extra to offer the motorist.

None of the oil companies are expected to fight the opinion, but Sperry & Hutchison Co. (S&H green stamps) has announced it will take the issue to court. The company is expected to file some kind of legal action as soon as the Bureau of Weights and Measures starts enforcing the ruling.

In his ruling, Mosk said it is permissible to give trading stamps with gasoline sales as long as the stamps are not advertised. But if any signs appear showing that stamps are offered, then a value must be placed on the stamps and displayed along with the posted price of the gasoline.

Texas, New Mexico Properties Are Sold

TEXAS PACIFIC Coal & Oil Co. in a $16 million deal last week snapped up all producing properties of Olsen Oils, Inc., Oklahoma City, and Jal Oil Co., Midland, Tex., from R. Olsen of Oklahoma City.

The properties included interests in 228 producing oil and gas wells on 74 leases totaling 20,700 acres in West Texas and Southeast New Mexico. Production net to purchaser now is running about 1,020 bbl. of oil daily from 170 oil wells and 22,000,000 cu. ft. of gas a day from 58 gas wells.

The production is mostly in Lea County, New Mexico, and Cochran County, Texas.

Payment will be partly in cash, partly in stock, and the remainder in payments out of production.

Nonproducing leases also acquired in the deal swell total properties changing hands to more than 25,000 acres.

Eugene T. Adair, president of Texas Pacific, said his company expects to net 446,000 bbl. of oil and 8.5 billion cubic feet of gas from the new properties in the first year of operation. This should increase in the second year, he said.

BRIEFS . . .

estimated at more than $4.5 million. Company officials say nearly all property damage was covered by insurance. The aniline department was destroyed and a number of other facilities were damaged, but the company says production in most departments is near normal and orders are being filled for Eastman fibers, plastics and most chemicals.

A butylene glycol plant with a capacity of 25 million pounds a year will be built at Bishop, Tex., by Celanese Corp. of America. This capacity is five times Celanese's current output of the chemical, which can be used as a plasticizer for polyvinyl chloride.

The $4 million Alberta refinery of Canadian Oil Companies, Ltd., is in full operation, a year after construction began. The new plant, located in the Bowden-Innisfail area of Central Alberta, will serve the company's 250 White Rose service stations and other Alberta dealers.

The 99% high-purity propylene capacity of Petroleum Chemicals, Inc., is being increased by 120 million pounds annually as part of the current expansion of the company's ethylene plant in Lake Charles, La. New equipment includes a propylene tower.

A natural-gasoline plant with a capacity of 25,000 M.c.f. per day has been completed at Mosherville, Mich., in the Albion - Scipio - Pulaski trend. Ohio Oil has the major interest in the plant with Humble's Carter Division holding 35% of the ownership.

In a move to acquire full control of Chemstrand, Monsanto Chemical Co. is planning to obtain American Viscose's half interest in Chemstrand stock and $9.5 million worth of Chemstrand notes held by Avisco through an exchange of stock. Avisco is to receive 3,540,000 shares of Monsanto stock with a current value of $135 million. Chemstrand will continue as a separate company. The transaction will be voted on by stockholders after company directors agree on final plans.

Also for Refiners . . .

IN THE NEWS: Arabs want more voice in running oil affairs and more profits from operations (p. 51) . . . Russians serve notice they will take more of the world market (p. 54) . . . A 2.3% gain seen for U. S. petroleum demand in 1961 by IPAA special committee (p. 56) . . . Interior officials propose new formula for import quotas (p. 58) . . . Industry figures show a gasoline surplus but conceal who has it (p. 62).

PLUS THESE TECHNICAL REPORTS: Butadiene from methane at Ravenna (p. 84) . . . How Shell cut pollution in the Rhineland (p. 93).

Company	Crude Oil			Gasoline			Kerosine		
All figures in thousands of barrels	Desired Oct. 1	Stocks Oct. 1	Above or below	Desired Oct. 1	Stocks Oct. 1	Above or below	Desired Oct. 1	Stocks Oct. 1	Above or below
Sinclair Oil Corp.	14,500	13,559	−941	7,800	8,081	+281	1,625	1,673	+48
Mobil Oil Co.	19,000	19,100	+100	14,050	14,400	+350	2,120	2,120	....
Shell Oil Co.	15,808	15,594	+214	14,139	14,754	+615	3,426	3,592	+166
Sun Oil Co.	5,852	5,352	−500	4,888	5,088	+200	210	210	.....
Texaco Inc.	20,100	18,946	−1,154	19,550	19,541	−9	12,635	12,377	*−258
Indiana Oil Purchasing	26,565	26,050	−515	16,587	16,605	+18	5,217	4,706	−511
Cities Service	8,500	7,285	−1,215	6,500	6,400	−100	1,500	1,448	−52
Gulf Oil Corp.	13,500	12,300	−1,200	14,700	16,700	+2,000	3,400	2,700	−700
Phillips Petroleum	2,208	1,975	−233	7,742	7,701	−41	684	686	+2
Standard Oil of Texas	750	819	+69	575	620	+44	40	56	+16
Atlantic Refining	5,787	6,455	+668	2,554	2,492	−62	1,119	1,313	+194
Humble Oil & Refining	20,400	18,400	−2,000	17,000	17,100	+100	3,600	3,600	....
Continental Oil Co.	4,450	4,449	−1	†3,506	†3,688	†+182	362	338	−24

*Includes distillate. †Includes unfinished gasoline.

Figures Still Show Gasoline Surplus, but

INDUSTRY figures show a 28,500,000-bbl. surplus of gasoline, but testimony of 13 major marketers before the Texas Railroad Commission shed little light on its location.

The companies testified October 20 in the commission's latest probe of crude and product inventories. About 70% of all U. S. gasoline is held by the 13, who reported to the commissioners they now have a combined total of 133,170,000 bbl. in storage.

As of October 1, the companies said, they would prefer to have stocks of 129,591,000 bbl.

The 3,579,000-bbl. surplus shown compares with a national surplus of 28,500,000 bbl. for October 7—based on desired national storage levels given the commission for October 1 at a hearing last spring.

Testifying to largest gasoline oversupply were Gulf Oil Corp., Shell Oil Co., and Mobil Oil Co.—with 2,000,000 bbl., 615,000 bbl., and 350,000 bbl. surpluses, respectively.

Gasoline storage of three companies on October 1 exceeded their stocks as of last March, at the beginning of the big gasoline-consuming season. They were: Gulf, with 16,700,000 bbl. on October 1 compared with 15,400,000 bbl. on March 1; Texaco, with

Geologists Urged to Seek Better Well Spacing

E. B. Miller, Jr.

"It's up to the geologist to prevent unnecessarily close well spacing . . ."

• Official says money saved by cutting out nonessential development drilling could pay most exploration costs.

ONE of the crying needs of the oil industry is more effective use of its development money.

And the money spent in drilling unnecessary wells could flow into geologic efforts to find new reserves. Hence, the geologist sits squarely in the middle of the well-spacing problem from the time the first exploratory well is drilled in an area.

This viewpoint was presented to 900 geologists in Biloxi at the tenth annual meeting of the Gulf Coast Association of Geological Societies.

E. B. Miller, Jr., chairman of the Oil Industry Conservation Forum, advised the oil finders to take a more active role in instigating proper well-spacing from the very beginning of development of a new field.

Miller, of Tidewater Oil Co., Houston, told the group that the geologist has an opportunity and a responsibility to plan ahead in the location of wells so they can be fitted into a reasonable and efficient development pattern.

"How many places can you cite where there are four wells drilled as close to a common corner as the law allows? Too many, I'm sure," Miller said. "And how many times have you refused to give dry-hole money or support a well unless it were drilled as close to your lease line as the law allows? Too many, I'm sure."

Exploration effort, the speaker declared, is an expense. He said that from some place within the earning structure of an individual operator, or of a company, enough profit must be generated to support this activity. Much of the cost could be raised from savings effected by the elimination of

Distillate			Residual		
Desired Oct. 1	Stocks Oct. 1	Above or below	Desired Oct. 1	Stocks Oct. 1	Above or below
10,200	9,541	−659	3,100	2,945	−155
18,930	18,480	−450	2,900	2,670	−230
11,504	11,253	−251	3,139	2,956	−183
3,189	3,189	.....	619	819	+200
(See Kerosine)			5,400	5,079	−321
11,623	10,803	−820	3,111	2,969	−142
9,000	8,443	−557	800	775	−25
14,000	13,700	−300	4,400	4,400	.....
7,365	6,561	−804	100	136	+36
266	249	−16	116	70	−45
5,936	5,444	−492	935	961	+26
17,300	17,900	+600	3,200	2,900	−300
3,789	3,171	−617	400	405	+5

September Runs of 13 Majors

Company—	Average runs in barrels daily	Runs as % of capacity
Sinclair Oil Corp.	412,400	88.9
Mobil Oil Co.	582,000	82.4
Shell Oil Co.	538,784	90.7
Sun Oil Co.	199,200	78.0
Texaco Inc.	663,591	89.8
Indiana Oil Purchasing	626,800	88.6
Cities Service	259,558	88.6
Gulf Oil Corp.	453,000	85.0
Phillips Petroleum	204,900	75.2
Standard Oil of Texas	41,092	54.79
Atlantic Refining	162,319	77.3
Humble Oil & Refining	817,200	84.9
Continental Oil Co.	173,512	81.0
Total	5,134,356	

Who Has It?

19,541,000 bbl. against 17,628,000; and Sun, with 5,088,000 bbl. against 4,952,000 bbl.

Texaco showed an upward shift also in its desired level of gasoline storage, with 18,200,000 bbl. desired for March 1 as against 19,550,000 bbl. for October 1. Actual stocks on October 1, it showed, were 9,000 bbl. below its desired level.

On the other hand the companies, as expected, were well below their total desired level on crude.

The same companies showed a total of 150,285,000 bbl. of crude in storage against a desired total for October 1 of 157,420,000 bbl., for a deficit of 7,135,000 bbl. Humble Oil & Refining Co. showed its crude inventories 2,000,000 bbl. below the level desired. Texaco, Gulf, and Cities Service each would like more than 1,000,000 bbl. of extra crude on hand.

Average runs to stills for the thirteen companies during September totaled 5,134,356 bbl.

Per cent of capacity operated in September ranged widely from Standard Oil Co. of Texas' 54.79% to Shell Oil Co.'s 90.7%. Median was 84.9%, and arithmetic average was 81.94%. Generally, runs were at considerably higher rates for the bigger firms than for the smaller ones.

Runs for Sun, Phillips, Atlantic, Conoco, and Standard of Texas were at an arithmetic-average rate of only 73.26% of capacity. Those for Mobil, Shell, Texaco, Gulf, Indiana Standard, Humble, and Sinclair compositely averaged 87.2% of capacity.

unnecessary development drilling.

"Lease after lease," Miller said, "may have the wells necessary to produce at a rate five times in excess of the maximum rate it actually attains during its life. This unused capacity wastes development money. There are instances where one operator has sent two or more wells after the same ultimate barrel simply because wells were a large factor in the proration formulas. Needless to say, physical laws divided up the barrel among the wells. This also is a waste of money."

In these proration formulas, Miller believes, too much emphasis is placed on the well factor and too little on acreage. He pointed to the recent Louisiana ruling assigning allowable on the basis of 50% credit for acreage as "a step in the right direction."

Another evil that is born of too much emphasis on the per-well factor is the buildup of excessive producing capacity, he said.

"The vast amount of capital being spent for development on unnecessary close spacing would be better spent to increase reserves of oil and gas," Miller concluded.

Conoco Buying Out Two Oklahoma Firms

CONTINENTAL Oil Co. is preparing to add about 1,400 bbl. daily production by purchasing properties of two Oklahoma oil companies.

Continental has paid $1,260,000 ($160,000 in cash and $1.1 million in reserved oil payments) to Dick Wegener and Clyde E. Davis Interests, Oklahoma City, for their interest in 62 oil wells and 12 gas wells on 52 leases in North Central and South Central Oklahoma. Production is about 200 bbl. daily.

More than half the reserves are in the Doyle and East Velma fields in Stephens County. Continental will operate the properties from its central region, headquartered in Oklahoma City.

The company, in another deal announced earlier, offered to buy the producing properties and nonproducing leases of Calvert Petroleum Co., Tulsa, for $10.5 million ($4.5 million in cash, $6 million in reserved oil payments).

The purchase agreement is subject to approval by Calvert's directors and holders of the company's stock.

Both the directors and stockholders of Calvert also must approve a plan for liquidation of the company if the purchase pact wins an okay.

Continental would acquire Calvert's 190 oil and gas wells in Illinois, Indiana, Oklahoma, Colorado, and North Dakota, producing 1,210 bbl. of crude daily. Also in the purchase would be 17,000 producing acres and 84,000 undeveloped acres in eight states. One-third of the undeveloped acres are in Kingfisher County, Oklahoma.

The Continental-Calvert deal does not include 16 drilling rigs and other equipment in Mid-Continent and Rocky Mountain states. Several officials and employes of Calvert plan to acquire the rigs and continue in the oil business.

The company was organized after World War II as Calvert Drilling Co. and changed its name to Calvert Petroleum Co. early in 1960. Much of its activity has been in Kingfisher County and other Northwest Oklahoma areas.

The Trend in Pipelining

	1959	1958	1953
Number of companies	85	82	78
Miles of pipeline:			
Crude trunk	61,860	61,702	
Crude gathering	49,567	49,787	
Products	37,732	32,865	
Total	149,159	144,354	
Deliveries (1,000 bbl.):			
Crude oil	3,603,870	3,379,071	3,118,552
Products	1,055,470	937,650	508,654
Total	4,659,340	4,316,721	3,627,206
Property value ($1,000)	3,196,909	2,946,567	2,313,295
Operating revenue ($1,000)	765,232	720,670	591,186
Net income ($1,000)	182,815	161,838	109,046
Number of employes	22,152	23,290	26,896

Pipeline Profits Up Again

• Return on investment still isn't remarkable, but at 5.7% it's better than some segments of the industry.

TRANSPORTING crude oil and refined products by pipeline is a good business and one that's getting better. But there are easier ways to make a buck.

Last year the 85 pipelines that report to the Interstate Commerce Commission had an aggregate net income of $182,815,269 against $161,837,838 the year before. That increase of 13% was a lot better than oil companies as a whole did.

Even so, return on pipeline investment was not exceptional. The pipelines reporting to the ICC had investments in property of $3,196,908,864 at the end of 1959. Their net income equaled only 5.7% on that investment.

This was a substantial improvement over earlier years. The same ICC report gives comparable figures back to 1953. In that year, 76 pipeline companies netted 4.7% on their investment. Thus, the pipelines did about 20% better in 1959 than they did 6 years earlier.

Their operating revenues last year were the highest ever. The 85 companies grossed $765,232,073 in 1959, almost $45 million better than in 1958. This was more than double what 73 companies reported 10 years before. While revenues were up more than 100%, total mileage was up less than 20% in the decade.

Total oil pipeline mileage reached a new high of 149,159 miles in 1959. It was made up of 61,860 miles of crude oil trunk lines, 49,567 miles of crude oil gathering lines and 37,732 miles of products lines.

Products lines, as they have been doing consistently in recent years, continued to lead in new construction last year. They added 4,867 miles in 1959 while crude trunk lines added only 158 miles and crude gathering lines lost 220 miles.

The increasing role of products lines in the transportation of oil is strikingly apparent from a 10-year comparison. Crude oil trunk lines dropped 2,285 miles and crude oil gathering lines, 1,120 miles in the past decade. While crude oil trunk and gathering lines dropped, products lines shot up 13,614 miles.

Pipelines are operating more efficiently than they used to. Last year they "terminated" 20,350 bbl. for every mile of line against 17,540 bbl. back in 1953. That's an improvement of 16% in unit throughput.

Fewer employes are now required to do the job. Back in 1953 there were 20 employes per 100 miles of line. By 1959, the average had dropped to 15. Compensation went up faster than the number of employes dropped. Operating employes averaged $5,278.96 per year in 1953 and $6,898.32 in 1959, an increase of a little more than 30%.

Oil pipelines, as a group, passed a milestone in 1959. Expenditures of $140,819,224 on new construction and $58,820,102 on new property along with other adjustments raised their combined investment in carrier property to almost $3.2 billion. It was the first time that pipeline investments had topped the $3 billion figure.

Condensate Line

...from Southwest Alberta to U. S. border is sought.

HUDSON'S BAY Oil & Gas Co., Ltd. has asked the Alberta government for permission to build a 41-mile pipeline for movement of unrefined condensate from gas fields in the southwestern part of the province to the international border.

The proposed line would cost about $1,700,000. It would include 11 miles of 4-in. pipe from the Waterton-Castle River area to Pincher Creek field and 30 miles of 8-in. pipe from this field to the border near Carway.

At the border the pipeline would connect with the Glacier Pipe Line System being constructed by Continental Pipe Line Co., a subsidiary of Continental Oil Co. Continental Pipe Line's system will extend from Cut Bank, Mont., via Billings to Platte Pipe Line Co.'s Byron station in Wyoming (OGJ, Oct. 24, p. 60).

The Hudson's Bay line would move 4,000 to 8,000 bbl. of condensate a day initially. Maximum capacity would be 32,600 bbl. a day.

Existing Interprovincial and Trans-Mountain pipelines transport Alberta production to the east and west. The Hudson's Bay line would open up southern markets.

PIPELINE

Service Pipe Line is building a 22.5-mile segregated pipeline system to gather heavy crude from 31 leases in the Beaver Lodge Devonian pool, Williams County, N. D. It includes 11 miles of 6-in. and 11.5 miles of 2-in. It will deliver the crude to Ramberg station, 9 miles south of Tioga, where two 10,000-bbl. tanks will be erected. The system will have 31 high-pressure field pumping units. Contractors are Oil Field Service, Inc., and Basin Pipeline Construction Co., both of Tioga.

Natural Gas Pipeline Co. of America has taken over the assets and operations of Peoples Gulf Coast Natural Gas Pipeline Co. in a move designed to gain more flexible operation

Montreal Refiners Join Air Pollution Survey

• Other industries helping in program aimed at fair pollution-control laws.

SIX OIL refiners in the Montreal area are taking steps to assure that any air-pollution-control laws adopted will be just and reasonable.

Along with several other industries, they have started an extensive survey to determine just what pollutants are being released to the atmosphere in eastern Montreal. Next step will be to trace them to their sources.

The problem apparently is one of smoke and particulate matter, such as plagues many industrial areas.

The role of hydrocarbons is yet to be determined. But from the experiences of refiners in Los Angeles, Philadelphia, and other large refining centers, the subject is almost certain to be thoroughly investigated.

Companies involved in the survey are British American Oil Co., Ltd.; BP Canada, Ltd.; Canadian Petrofina, Ltd.; Imperial Oil Ltd.; Shell Oil Co. of Canada, Ltd.; and Texaco Canada, Ltd. Combined capacity of their six plants, all in the highly industrialized east end of Montreal, is about 300,000 bbl. daily.

These refiners and 10 other companies in the area have formed Laval Industrial Association, for the purpose of conducting the survey. Cost of the program is being shared proportionately.

TECHNICIAN at mobile laboratory collects air samples in industry-sponsored survey to determine kind of pollutants being released in atmosphere of eastern Montreal.

Included in the group are three petrochemical plants, an asphalt plant, a large copper refinery, a cement plant, and abattoir, a sulfur plant, and several textile, paper, wood, and metal-converting industries .

. . . **Eight sampling stations** have been set up, including a mobile laboratory, in a 25-sq.-mile area. These provide around-the-clock data on such atmospheric contaminants as dust, soot and fly-ash, sulfur dioxide, hydrogen sulfide, aerosols, and peroxides. Wind velocity and direction, as well as air temperature and humidity, also are permanently recorded.

Some 12 dustfall collectors are distributed throughout the area to locate the zones of heaviest fallout.

At two other stations, high-volume samplers determine the aerosol content of the air. The mobile laboratory also serves as a base for water-pollution studies being made at five check points in the St. Lawrence River.

BRIEFS . . .

and effect administration economies. Both are subsidiaries of Peoples Gas Light & Coke Co. and both operate mainlines from Texas to Joliet, Ill., Natural Gas from north Texas and Peoples Gulf Coast from the Texas Gulf Coast area.

Oxygen will be moved by pipeline next year after Linde Co., a division of Union Carbide, completes a plant to produce high-purity oxygen and high-purity nitrogen on the Houston Ship Channel. The 8-mile pipeline will deliver oxygen to Arco Steel and Diamond Alkali. Linde has contracted to supply Armco with 140 tons of oxygen and Diamond Alkali with 320 tons of oxygen and 105 tons of nitrogen per day.

Louisiana Gas Production is building 25 miles of 8 to 16-in. products line in Union Parish, Louisiana. Work started early in October. It is expected to be completed this year. Contractor is Ford, Bacon & Davis Construction Corp.

Washington Gas Light Co., Washington, D. C., has been authorized by FPC to build 15.8 miles of 24-in. line from Hybla Valley, near Alexandria, Va., across the Potomac into Prince Georges County, Maryland. It will also connect two existing lines in the District of Columbia and convert a 5.36-mile distribution line into a transmission line.

Transwestern Pipeline Co., Houston, will take gas from United Carbon Co.'s Shamrock station in Wheeler County, Texas, under temporary authority granted by FPC. It will involve construction of 24 miles of 8-in. line, a 3,520-hp. compressor station and a measuring station. The facilities, according to Transwestern, will make reserves available in excess of 40 billion cubic feet.

Also for Pipeliners . . .

IN THE NEWS: IPAA told gas regulations are here to stay and any new legislation must be a compromise (p. 57) . . . Profits of pipeline firms show a 13% increase in 1959 (p. 64).

PLUS THESE TECHNICAL REPORTS: Pipelines play key role in European growth (p. 88) . . . What's involved in European importation of liquid methane (p. 138).

New Oklahoma Water Flood Gets Under Way

• Three different sands in Northeast Purdy field will be flooded. Project will eliminate 519 tank batteries.

INJECTION has started on an Oklahoma flood which is expected to produce 85 million barrels of oil in the next 15 years.

The project, in the Northeast Purdy units of Garvin County, includes the water flooding of three sands discovered 9 years ago. They are the Hart, Springer A, and Springer B.

Current production is 15,200 bbl. daily. This will be kicked up to 27,000 bbl. daily in 5 years. In 1970, daily production is expected to be 19,800 bbl.

Flood plans . . . The operator, Cities Service Oil Co., has one water plant in operation and is injecting through 16 wells.

By January, it expects to have three more water plants injecting water. The four plants, by then, will be servicing 125 input wells. A two-cylinder, 230-hp gas engine drives each pump in the closed system plants.

The water input will average 400 bbl. daily per well in the Hart formation and 600 bbl. per well in the Springer sands. The first response from the flood is expected in 10 to 12 months.

Production . . . Oil will be gathered, and wells tested through 46 separate satellite stations. Initially, the stations will be manually operated but later they may be completely automated.

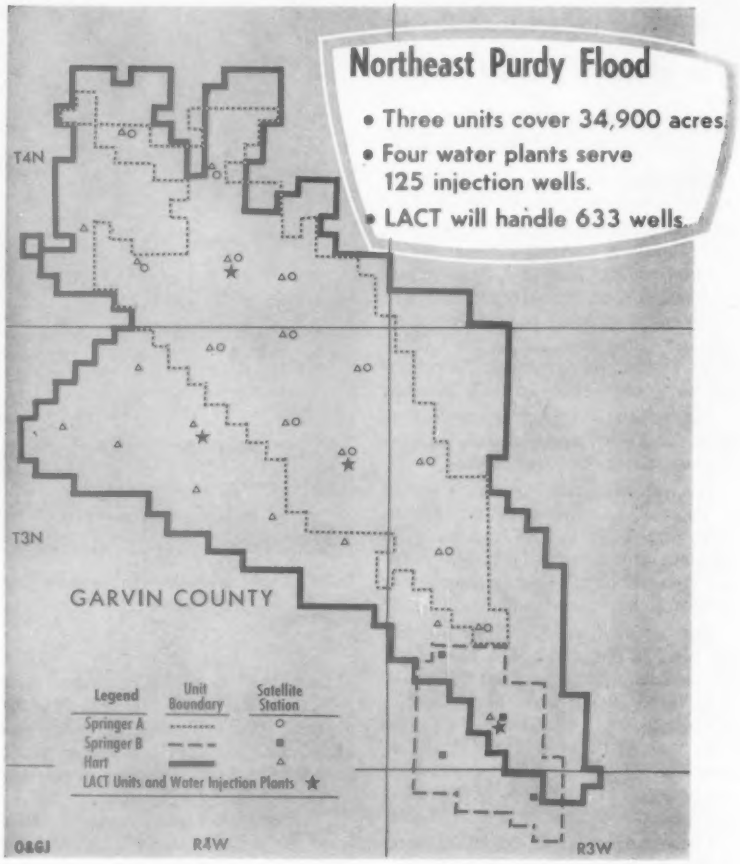
From the gathering points crude will move to seven automatic custody transfer units at four locations. Included in the units are positive-displacement meters, oil sampling equipment, and facilities to transfer crude to pipelines. The 519 tank batteries now serving the field will be displaced.

The units . . . The Purdy units were approved by the Oklahoma Corporation Commission in December 1959, after 4 years of negotiations. There are 264 working interests in the field and 3,500 royalty owners.

The Hart sands, from 7,050 to 7,500 ft., are under about 22,400 acres. The Springer A at 7,600 to 8,500 ft., includes 10,000 acres. A portion of this formation lies under the Hart. The Springer B, to the south, has 2,500 acres and is between 8,050 and 8,600 ft.

Hart production reached its peak with 16,600 bbl. daily in April 1957. The Springer B sand peaked at 4,600 bbl. daily in the same month and the Springer A formation hit its top of 16,500 bbl. daily in February 1956. Primary production has been on a gradual decline since.

Engineers estimate 26% of oil in place might have been produced by continued primary production. The flood is expected to push this figure nearer the 50% mark.



Flooding Planned in West Texas Field

OPERATORS in Johnson field in Ector County, West Texas, plan a unit and water flood which they expect to double ultimate oil recovery from the field's Grayburg-San Andres lime pay to roughly 18,650,000 bbl.

The plan, submitted by Cities Service Oil Co. and under consideration by the Texas Railroad Commission, calls for unitizing and flooding the entire field. The unit agreement has been signed by 100% of both working and royalty interests.

It would unitize 5,027 acres. In testimony before the commission, Cities Service, the proposed unit operator, said the Grayburg-San Andres primary production is now about 97½ % depleted.

Discovered in 1934, the field had produced 9,214,482 bbl. as of July 1, 1960. Cities Service placed productive acreage in the proposed unit at 3,720. There are now 84 producing wells in the field making an average of about 6 bbl. a day each.

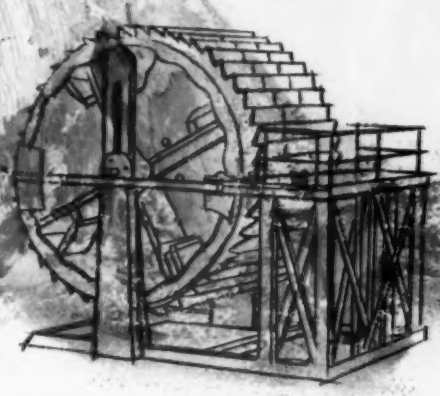
Flood plans call for a peripheral injection pattern if feasible, otherwise an 80-acre, five-spot pattern. Injection water will come from the Santa Rosa formation at about 1,100 ft.

Recovery from the 4,150-ft. Grayburg-San Andres due to the flood is estimated at 9,450,000 bbl.

THE QUALITY OF THINKING

From an almost unlimited scope of thought, Leonardo da Vinci brought forth a stream of inventions which — in modern form — are in use today. However, Leonardo's greatest contribution was simply the triumph of creative thought applied to practical results. His work will stand for all time as proof that the appraisal of quality applies to thinking as well as to tangible objects and to visible or audible processes.

In a related sense, the quality of engineering is measured by results. And it is by results alone that the minds responsible for an engineering project can be evaluated. When you check the record of Brown & Root's engineering through the years, the high quality of thinking is self-evident. Customer satisfaction from greater efficiency at lower costs has built a worldwide reputation for engineering and construction by Brown & Root.



This squirrel-cage blower, invented by Leonardo da Vinci and put to practical use, was a significant step toward modern mechanical air conditioning.

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Wire Rope at Work in the Azalea Field. At the time of the photograph, the BBM Drilling Company was 10,200-ft deep in this well in the Azalea Field, Midland County, Texas. The Bethlehem Wire Rope, 1¼ in. 6 x 19 Seale, Formset Purple Strand, right lay, with IWRC, had been in service for some time. Yet it still was in superb condition, ready to chalk up many additional ton-miles.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA. *Export Distributor:* Bethlehem Steel Export Corporation

Wire rope mill depots and distributors from coast to coast stock Bethlehem Rope

BETHLEHEM STEEL

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Is the Worst Over? Wall Thinks So

• Drilling will pick up, investment will rise, and prices may well become firmer, California Oil Co. head says. This year will be a good profit year.

OPTIMISTIC forecasts for both the short and long term in domestic and international oil operations were issued last week to dispel pessimism arising from the current world oversupply.

E. E. Wall, president of California Oil Co., believes the domestic industry is rapidly moving out of the doldrums, assuring a good profits year in 1960 and the beginning of a new period of growth.

Wall, in an address before the Fifth Management Conference, Pennsylvania Petroleum Association, offered this outlook for the near future:

"In general terms, I think we can sum up our next year nationally and internationally by stating that demands should reach new peaks. Drilling will be stepped up, particularly as inventories correct themselves. Investments in processing equipment will rise to new heights . . . and marketing competition, while intensified, will result in substantial boosts in product demands which could well lead to firmer prices."

Wall expects a "quite profitable last half this year" for the U. S. industry.

He also is unimpressed by the gloom occasioned by the low crude-oil producing rate in this country. "We may, in fact, be hard put even in the near future to provide for our own needs from our own resources," he says.

Long-term demand growth . . . To support his optimism, Wall offered the following demand projections "which have been agreed upon by most oil economists" for the period 1959-75: (For comparison, see article, "Europe's Future Is Tied to Oil," in Special European Report.)

. . . **A 130%** increase in gasoline demand in western Europe.

. . . **A 210%** increase in distillate demand in western Europe.

. . . **A 200%** increase in fuel-oil demand in western Europe.

. . . **A 200%** increase in demand for all petroleum products in the rest of the free Eastern Hemisphere.

. . . **A 50%** increase in U. S. gasoline demand.

. . . **A 60%** increase in U. S. demand for other products.

. . . **A 55%** increase in total U. S. domestic demand, or an increase of about 6 million barrels per day, boosting demand to more than 15 million barrels a day.

. . . **A 150%** increase in demand for all petroleum products in the Western Hemisphere outside the U. S.

Wall pointed out that plant capacities would have to be increased correspondingly, requiring substantial investments for the next 15 years.

Competitive fuels . . . Wall considered his forecasts to be conservative, with economists making allowances for the effects of competitive fuels and keeping well within the bounds of expected energy requirements.

In Europe, natural gas will increase to some extent, "but it doesn't look as though it will become a major factor in the European energy picture for some years yet." Coal "has just about reached the limits of its production capabilities."

In the United States, "petroleum will continue to encounter severe competition from both natural gas and coal. However, I don't think it's a head-in-the-sand approach to say that there is more than enough room for all . . . and all will continue to grow."

Atomic energy is furthest advanced in the production of electricity. A number of such plants are under construction in Europe and the United States, "but the combined output of all such installations scheduled for completion by the mid-1960's is considerably less than the normal capacity added to the nation's power system in the course of 1 year." Costs will prevent extensive nuclear development for 10 to 15 years, Wall thinks.

Merchant ships now absorb about 1.5 million barrels of oil per day, a market which oil will hold for some time before nuclear propulsion has any impact.

Wall expects nuclear energy to stimulate, rather than retard, petroleum prosperity.

End of foreign boom? . . . Wall suggests that the problems of foreign exploration and development and marketing may have ended the trek abroad for domestic operators.

"In the last few years," he points out, "many companies, uninitiated in the risks and intricacies of foreign exploration and development, have marshaled their forces and resources and gone out to discover foreign oil.

"Many who have discovered new fields have found that it is difficult to sell substantial quantities of this oil, even at cut-rate prices. They have, however, been a factor in the market.

"It is interesting to note that because of this, the so-called boom days of foreign oil appear to be over."

Humble Markets in Oklahoma

• First station is already operating and three more are in the works. This gives Humble outlets in 40 states.

HUMBLE OIL & Refining Co. has hurdled the Red River and opened a service station at Lawton, Okla., its first in the state.

A former Standard Oil Co. (Ind.) jobber was tagged by Humble to lead its invasion of Oklahoma, its fortieth marketing state.

L. H. Whitten, 9 years a station operator and an Indiana Standard jobber for the past year, said Oklahoma's first Humble station is one he built a year ago at a major traffic intersection of U. S. Highway 62 and Sheridan road, near Fort Sill military reservation. It averages better than 30,000 gal. a month.

Whitten said three other Humble stations are being built, two six-pump affairs and a four-pump outlet. One is in a new shopping center and the others on main traffic ways, all near Fort Sill. Each will cost about $30,000, exclusive of land, and all will be opened in January. Other sites in the area are being considered.

Tom Edwards, Dallas, a regional sales supervisor for Humble, is in charge of the new southern Oklahoma sales area.

Entry into Oklahoma is part of Humble's announced program to go nationwide as a marketer. Since the Humble merger in September 1959, retail marketing also has pushed into four other states—California, Nevada, Ohio, and Arizona.

Expansion in California . . . The Humble oval will go up for the first

Oregon Test Is Dry

HUMBLE OIL & Refining Co. has failed to find oil in the first test on a half-million acres leased in southern Oregon and northern California.

The test well, 22 miles northwest of Lakeview, Ore., went to 12,093 ft. and was plugged and abandoned last week. The projected depth had been 12,000 ft. when the well was spudded July 25.

The dry hole was labeled the 1 Thomas Creek, 18-36s-18e, Lake County.

time in California next month. Humble has bought 23 stations in Orange County which had been selling Richfield Oil Corp products. These stations were operated by the A. H. Shipley Co., Anaheim.

Last spring Humble moved into the California market with the purchase of Major Gas Stations, Inc, an independent marketer (OGJ, June 27, p. 80), but the stations continued to operate under the Major brand.

With the purchase of the Richfield stations, Humble has 34 outlets in California. Of the 26 stations acquired from Major, 15 were in Arizona and Nevada.

Ten states still without Humble retail-gasoline outlets are Minnesota, Michigan, Kansas, Missouri, Mississippi, Alabama, Georgia, Florida, Alaska, and Hawaii.

New Texas Gas Line Planned

LONE STAR Gas Co. has revealed plans to lay a new 52-mile 18-in. gas line from its system at Springtown, Tex., in Parker County, to take more gas from a growing source of supply in West Central Texas.

The new line, which will have an initial capacity in excess of 100,000,000 cu. ft. daily, will extend from Springtown across Parker and Palo Pinto counties to Gordon. There it will tie into Lone Star's Gordon gasoline plant and the east end of a recently completed 12-in. line terminating near the corner of Brown, Comanche, and Eastland counties.

The new $2,000,000 line will move gas from a growing number of new fields in the general area, particularly in Erath, Palo Pinto, and Stephens counties. At Springtown, the line will tie into a 48-mile, 20 and 24-in. main recently completed by Lone Star to Dallas County to tie in with distribution lines there.

watching WASHINGTON

Clyde La Motte

• Is there antitrust danger in area-pricing plan? . . .

IT MIGHT BE well for gas producers to get the Justice Department's views on procedures to be followed in any organized effort to seek a hike in the area prices specified by the Federal Power Commission.

The fact that the FPC has suggested that producers in an area get together to furnish evidence for any proposed price increase does not protect the producers from possible antitrust action by the Justice Department.

It appears obvious that some precautions would have to be observed.

Certainly, producers would be treading on dangerous ground if they got together and decided upon a specific price they would seek jointly.

There would be even more danger if they were to agree to refuse to sell gas at lower than a specified price.

It is quite possible, however, that joint producer action could be taken safely as long as the producers merely submitted cost data, cost-trend information, and other such evidence tending to show that the price ceiling established by the FPC for their area was too low.

Such action, since it would leave price determination entirely up to the FPC, should cause the Justice Department no concern.

• A ball park may be needed for area-price hearings . . .

ANOTHER FEAR of many observers is that the area-pricing approach may bog down in actual practice and be as time-consuming as the old individual-rate-base method.

This stems from the obvious intent of the FPC to continue to consider cost as a factor in determining prices.

As some foresee it, any action to get an area price changed would therefore involve almost endless testimony from the hundreds of producers in a given area—as well as from the large number of possible intervenors who would be affected in one way or another.

"The FPC would have to rent the Washington ball park to provide room for all those participating in such a hearing," one gas industry representative in Washington commented the other day.

And, after a decision was finally reached, there would no doubt be countless appeals. This would cause further delays.

Hopes of avoiding such a jam now center around the ability of the FPC to establish clear-cut guidelines as to what type of evidence it will want and how this is to be presented.

The concensus of gas-industry representatives in Washington—including representatives of producers, pipeline companies and distributors—appears to be this: The FPC has made a great deal of headway toward a practical solution to the regulatory problem. But it still has a long way to go before a definite, feasible pattern emerges.

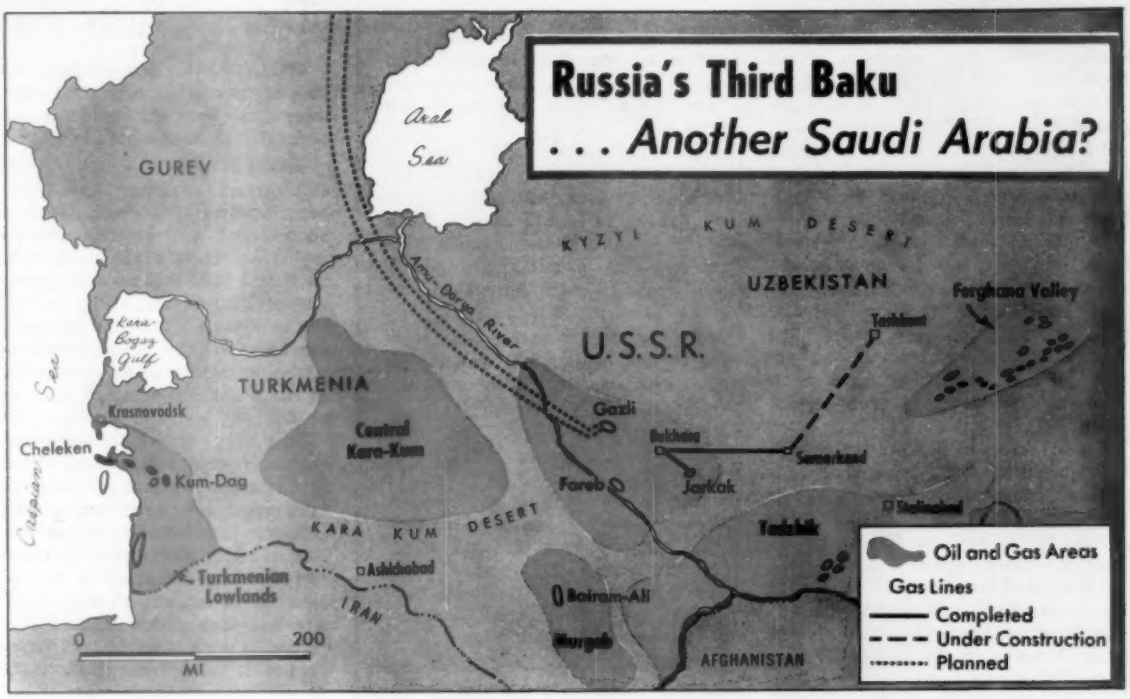
• Status of a gas line's production is uncertain . . .

INTERSTATE PIPELINE companies are still uncertain over how the FPC intends to treat the pipeline company's own gas production.

Their position is that when they are in the role of a producer, they should be treated as any other producer. Thus, they feel, they should receive area prices for their gas rather than being limited to a strict cost-based price.

They have been cheered by the flat statement of FPC Chairman Jerome Kuykendall that he, too, feels that pipelines should be credited with the area price for their own production.

But they also note that in the Phillips case decision, the commission was careful to spell out the ways in which a pipeline company and an independent producer differ.



Soviets Claim Huge Reserves in Desert Area

• "Third Baku" is the imposing title given a vast, arid region east of the Caspian Sea. Russians already are claiming a gas field to rival the world's biggest and oil reserves comparable to Kuwait and Saudi Arabia.

RUSSIA is pouring men and money into a vast oil region east of the Caspian Sea that it calls the "Third Baku."

Soviet geologists believe this huge desert region lying to the north of Iran and Afghanistan has reserves comparable to those in the original Baku, on the western shore of the Caspian; and in "Second Baku," extending from the Volga River to the Ural Mountains.

If the geologists are right, Russia is assured vast oil and gas supplies to meet its long-term needs. It also will make available for export a great deal more Soviet crude in future years.

The ultimate prospects for the area are still largely a question mark. But here are some of the things that point up Russian hopes:

. . . **New oil and gas discoveries** in Turkmenia and Uzbekistan indicate at the very least that these Central Asian areas will make sharp production gains in the 1960's.

. . . **A new gas field at Gazli,** Uzbekistan, is believed to be the largest in the USSR, and possibly the world.

. . . **Reserves "not inferior** to those of Saudi Arabia and Kuwait" in the Bukhara-Khiva district and surrounding Kara Kum and Kyzyl Kum Desert areas are claimed by A. A. Bakirov, professor at Moscow's Institute for the oil and gas industry.

. . . **Refining and petrochemical** centers as large as those in the Caucasus and in Second Baku areas such as Bashkira and Tataria will spring up in the deserts of Central Asia, according to confident predictions of other Soviet experts.

Poor climate, good geology . . . "Third Baku" production is bounded on the east by oil fields on Cheleken Peninsula on the east coast of the Caspian, and on the west by oil and gas fields in Ferghana Valley.

Both areas have produced small amounts of oil for decades. There has been production at Cheleken in western Turkmenia since the early 1800's, when the area was still an island. The first oil discovery in Ferghana Valley of Uzbekistan was made in 1904.

But important new oil and gas finds are now being made in the 1,000 miles of desert that lies between. Turkmenia and Uzbekistan together comprise an area of about 348,000 square miles, larger than Texas and Oklahoma combined. Of this, more than 190,000 square miles are described as "promising oil and gas land."

One reason for the delay in exploring the region has been the rugged climate. Russian officials say the Turkmenia climate is "the worst of any oil-producing region in the USSR." The republic is 90% desert. One of the deserts, the Kara Kum, covers 70% of the area, and is the fourth largest in the world.

But Russian geologists emphasize that beneath the arid surface, of Turkmenia and Uzbekistan "there is a great stratigraphic range of oil-bearing formations." Wildcats encounter multi-layer type deposits with up to

15 or 20 horizons. Chances also are excellent for newly-discovered fields to have large reserves.

Turkmenia at present ranks third among Russia's 15 republics in oil production. About 5 million tons, or 100,000 bbl. daily, production is expected this year. This compares with 2.3-million barrels daily scheduled from European Russia, including Second Baku, and 360,000 bbl. daily from Azerbaijan, or old Baku.

While this level of output is relatively small, plans for development are moving ahead rapidly. Early last year, Russia set a goal of 150,000 bbl. daily for Turkmenia by 1965. In the meantime, however, at least six new oil and gas fields have been found, and the target has been stepped up to 200,000 bbl. daily.

These discoveries were made not only in Turkmenia's established producing area along the Caspian, but in the central and eastern areas, where around 60 oil and gas bearing structures are being explored.

Uzbekistan, ranking sixth among the producing republics, has taken a new lease on life with discoveries in recent years in the Bukhara-Khiva area. Uzbekistan production is scheduled to expand from about 32,000 bbl. daily to 60,000 bbl. daily by 1965.

Prolific gas area . . . Gas finds, however, are running ahead of oil, and vast new reserves are being tapped in both Turkmenia and Uzbekistan.

The Soviets estimate Turkmenia's gas reserves at about 92 trillion cu. ft. This includes 4.2 trillion cubic feet in the western Turkmenian lowlands along the Caspian, the only well-explored area of the republic. Another estimated 24 trillion cubic feet lie on the Turkmenian side of the Bukhara-Khiva district, near the Amu-Darya River. Another 62-trillion cu. ft. are in the huge, poorly explored central Turkmenian platform covered by the Kara-Kum Desert.

Uzbekistan Republic's total gas reserves are estimated at 53 to 71 trillion cubic feet. More than 80% of this is believed to be in the Bukhara-Khiva region. Under the current 7-year plan, gas production in the republic will soar from 6 billion cubic feet in 1958 to 646 billion cubic feet in 1965. Output is scheduled to reach 1.9 to 2.1 trillion cubic feet by 1975. Some gas wells in the Bukhara-Kiva District test better than 100 million cubic feet daily.

Russia is planning twin 1,400-mile 40-in. gas lines from Gazli field to the metallurgical centers of Chelyabinsk and Sverdlovsk in the Urals. It already has a gas line from Jarkak field to Bukhara and Samarkand. The system is expected to reach Tashkent this year (OGJ, Sept. 14, 1959, p. 80).

Trans-Caspian pipeline possible . . . Because of the possible impact on free-world markets, Turkmenian developments are of special importance to the West.

Soviet geologists believe that oil fields along the eastern side of the Caspian are an extension of the prolific Azerbaijan fields around Baku and the Apsheron Peninsula. They believe that rich oil structures underlie the 150-mile wide sea bottom, and extend to the south as far as Iran.

Offshore production on the eastern Caspian is extending further and further toward production coming out from Baku on the other side. Someday they may become virtually one operation.

The receding water level in the Caspian, while creating problems for the caviar industry, is aiding this link. Reefs, which were submerged as recently as the 1930's are now above water. Off-shore islands are growing bigger, or as in the case of Cheleken, have become wide peninsulas.

A submerged pipeline is under consideration from Krasnovodsk Peninsula, on the eastern shore, to Apsheron Peninsula. Crude reaching Baku via such a line could then be refined on the spot, or pumped west through the existing system to the Black Sea for export.

Soviet engineers have also discussed the possibility of using nuclear blasting to build a 150-mile tunnel under the sea between Krasnovodsk and Apsheron. They estimate that the project would take from 5 to 7 years, allowing time after every detonation to minimize radiation hazards.

In the meantime, crude and products from the eastern side move by tanker to Makhachkala, which has a pipeline connection with Tuapse on the Black Sea.

Oldest may be best . . . The Cheleken producing area on the east coast of the Caspian Sea is regarded as one of Turkmenia's most promising exploration areas, despite the fact it is the oldest. Deep drilling is paying off, and lower horizons are far from fully explored.

Geologists have called Cheleken "a smashed plate" because the oil-bearing structures consist of "many dozens of blocks isolated from each other." They also have referred to it as a "boiling samovar" because of hot springs. A well may encounter prolific oil on an unpromising location, or hit hot water on a promising one. The area boils and seethes. One active volcano has a crater full of oil.

A chain of oil fields now extends from Cheleken field southeastward into the Kara Kum. The first in the chain is Kotur-Tepe, where there were 44 producing wells in September. Others are Nebit-Dag and Kum-Dag oil fields, and Kyzyl-Kum gas field, which has estimated Tertiary reserves of more than 350 billion cubic feet.

The Caspian's east coast immediately north of Iran has yielded significant gas and oil discoveries in the last 2 years in the Chikishlyar-Keimiro-Okarem area.

Three big gas discoveries have been made since last year in the central Kara Kum. The exact locations of the finds have never been reported.

Further east, a gas strike east of the Amu-Darya River this year has confirmed predictions that Bukhara-Khiva fields would extend into Turkmenia. The find, at Fareb, flowed better than 12 million cubic feet daily from 9,400 ft.

Considerable exploration effort is being made in the Tadzhik Depression, lying along the Afghanistan border, where the first commercial find was made in 1934. In the Murgab area, "very promising" oil-bearing structures have been found about 150 miles north of Kushka.

"Doris" Cuts Paper

MOST of the paper work in handling products orders from customers has been eliminated at one of England's busiest bulk terminals.

A new system of direct order recording and invoicing (DORIS) has been installed at Royston depot of Shell-Mex & BP, the joint marketing organization of Royal Dutch-Shell and British Petroleum in the United Kingdom.

The system eliminates the writing of individual sales tickets on telephone orders. At Royston, 85% of the customers call in their orders.

Shell-Mex & BP planned the system in conjunction with Creed & Co. when a growing volume of sales created a need for greater efficiency and speedier office procedure. If the new automatic order-recording is successful, it will be installed in other Shell-Mex & BP terminals throughout the country.

Similar type systems might be applicable to big bulk plants in the U. S., or elsewhere.

Key to the "direct order recording and invoicing system (DORIS)"

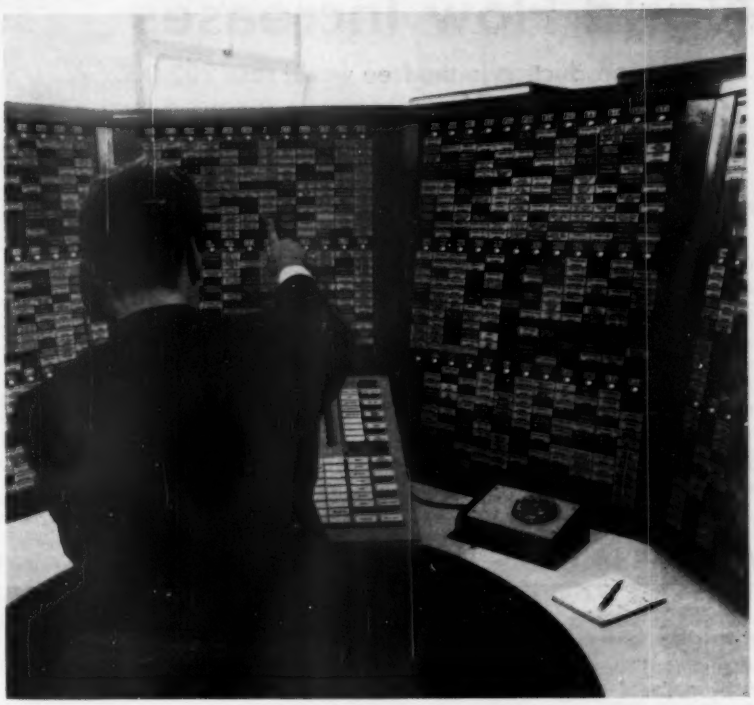
Work at UK Plant

is the input console. A sales clerk is stationed in the center of the console, surrounded by seven panels that carry the names and addresses of up to 3,000 customers in alphabetical order.

When a customer calls in an order, the clerk, who wears a telephone head set, presses the button bearing the customer's name. A smaller panel has buttons which are pushed to give the product ordered, quantity, day of delivery, method of delivery, type of package, etc. The terminal handles various grades of gasolines, oils, and a dozen grades of lubricants.

The push-button information is recorded on paper tape. To this is added standard, or static, information about the customer or product. The static information is stored on reels of seven-channel strengthened paper tape in special magazines.

The equipment then produces a sales ticket and invoice with all required information. The punched tape further reduces paper work by providing summaries for accounting and statistical purposes.



ORDER BOARD has buttons for thousands of bulk terminal customers. Phone orders are punched into the machine which then writes the sales tickets. Only a portion of the seven panels which surround the clerk is shown.

Nationalization Is Threatened by Indonesia

- But the move is considered to be the opening gambit in the country's negotiations with private companies on taxes and exchange. The fear of losing world markets makes an outright takeover unlikely.

THE SOCIALISTIC Indonesian Government is waving its biggest club preparatory to opening negotiations with private oil companies on tax and foreign exchange agreements.

The government's draft of a new mining law released last week provides for nationalization of the oil industry.

If enacted, the law would give the government the right to arbitrarily cancel exploitation rights of Standard-Vacuum, Caltex, and Royal Dutch-Shell, the three private operators in the country.

Observers in Jakarta believe the government does not plan outright nationalization of the industry because of a fear that this step would result in the loss of world markets for Indonesian oil. They believe the government may plan to use the new legislation in an attempt to win more favorable terms from Stanvac and Shell in coming talks on tax and foreign exchange agreements, and as a means of gaining more control over the industry.

Forty-year concessions held by the companies still have years to run. But tax and foreign exchange agreements that determine the profitability of the operations expire December 31, in the case of Shell and Stanvac, and the agreements with Caltex end in 2 years.

At present the government receives a straight 50% cut of each company's profits. If import duties on equipment and local taxes were fully applied, the government's share of profits would rise to between 70 and 80%. Companies also leave earnings in dollars in foreign banks. These are converted into Indonesian rupiahs only as required to cover local expenses.

The First Minister, Djuanda Karawidjaja, says flatly that these tax and foreign exchange agreements will not be renewed. He indicated that all concession contracts would have to be adjusted to conform to the new mining law. Under its terms, companies would produce oil for the government, and retain and market part of the crude as payment.

Caltex is the biggest producer in the country, producing at times more than 220,000 bbl. daily from Central Sumatra. Shell is the second-ranking operator with about 117,500 bbl. daily from Sumatra, Java, and Indonesian Borneo. Stanvac produces more than 70,000 bbl. daily from Central and South Sumatra.

The proposed law would also pose a threat to the country's refining industry, which has an over-all capacity of 273,800 bbl. daily Stanvac has a 77,000 bbl. plant at Sungei Gerong. The remaining capacity is operated by Shell with four plants.

World Flow Increases

• Crude production in the free world rose 202,000 bbl. daily in August. U. S. output was also up.

FREE-WORLD crude production rose in August with gains in the United States and other areas.

Output was higher both in Venezuela and the Middle East, where gains made by Iran and Iraq offset lower production in Saudi Arabia and Kuwait.

Trinidad production returned to normal after a crippling strike that almost cut output in half the preceding month. In Colombia, however, production slipped to 111,400 bbl. daily as the result of a 32-day strike in the Barco Concession, which ended early in September.

The French continued to reap the benefit of their exploration success with all time high records of 41,200 bbl. daily in France proper, and 178,000 bbl. daily in Algeria.

TREND OVER THE LAST YEAR

	Western Hemisphere less U. S.	Middle East	Total free world outside U. S.
1959			
August	3,859.8	4,655.7	9,386.0
September	3,887.5	4,635.5	9,396.4
October	4,069.6	4,699.2	9,629.8
November	4,123.2	4,820.7	9,877.9
December	4,218.5	4,682.0	9,861.5
1960			
January	4,316.5	5,065.3	10,334.7
February	4,389.5	4,986.5	10,313.2
March	4,156.4	5,146.3	10,346.8
April	4,069.5	4,925.5	10,055.1
May	4,317.4	5,286.2	10,680.2
June	4,285.4	5,164.5	10,568.2
July	4,214.2	5,103.5	10,448.3
August	4,286.5	5,146.8	10,570.6

World-Wide Crude Production: Daily average in thousands of barrels

Country—	August 1960	July 1960	August 1959
Western Hemisphere			
Argentina	168.1	168.1	124.9
Bolivia	8.4	8.4	9.1
Brazil	76.0	76.0	70.1
Canada	514.9	525.0	512.1
Chile	19.0	19.0	18.1
Colombia	111.4	154.7	156.4
Cuba	0.2	0.2	0.5
Ecuador	7.8	7.8	7.5
Mexico	279.2	279.2	264.6
Peru	52.2	52.2	48.8
Trinidad	121.3	68.5	114.2
Venezuela	2,928.0	2,855.1	2,533.5
Total	4,286.5	4,214.2	3,859.8
Europe			
Austria	45.2	45.3	45.7
France	41.2	39.7	33.4
West Germany	107.0	108.0	100.4
Italy	40.4	40.4	36.1
Netherlands	37.7	37.4	34.0
United Kingdom	1.7	1.7	1.6
Yugoslavia	19.5	19.5	11.7
Total	292.7	292.0	262.9
Middle East			
Bahrain	45.1	45.1	45.2
Iran*	1,048.0	950.0	889.0
Iraq†	985.9	895.0	898.5
Israel	2.0	2.0	2.0
Kuwait	1,589.9	1,700.2	1,431.5
Neutral Zone	135.0	132.0	113.6
Qatar	174.8	174.7	171.5
Saudi Arabia	1,159.7	1,198.1	1,096.6
Turkey	6.4	6.4	7.8
Total	5,146.8	5,103.5	4,655.7

Country—	August 1960	July 1960	August 1959
Other Asia			
British Borneo	103.0	103.0	114.7
Burma	10.5	10.5	11.0
India	8.5	8.5	8.5
Indonesia	423.8	427.3	367.2
Japan	10.1	10.1	7.8
New Guinea	4.5	4.5	4.3
Pakistan	5.9	5.9	6.6
Total	566.3	569.8	520.1
Africa			
Algeria	178.8	170.3	18.3
Angola	1.0	1.0	0.9
Egypt	64.4	63.1	38.3
Gabon	16.5	16.8	16.0
Morocco	2.1	2.1	2.0
Nigeria	15.5	15.5	12.0
Total	278.3	268.8	87.5
Free World			
Foreign	10,570.6	10,448.3	9,386.0
United States	6,940.0	6,860.0	6,766.0
Total	17,510.6	17,308.3	16,152.0
Communist Countries in Soviet Orbit			
Romania	231.0	231.0	235.0
Russia	2,850.0	2,850.0	2,688.0
Other Communist	100.0	100.0	60.0
Total	3,181.0	3,181.0	2,983.0
WORLD TOTAL	**20,691.6**	**20,489.3**	**19,135.0**

Figures are from reliable industry reports or government sources. Estimates are made where complete reports are lacking.
*Includes estimated 6,000 bbl. daily from Naft-i-Shah field not operated by Consortium companies. †Includes estimated 3,500 bbl. daily from Naft Khaneh field, operated by Iraq Government.

Belgian Plant Will Refine Sahara Oil

SN REPAL has signed an agreement for the processing of its Hassi Messaoud crude in the 14,000 bbl. Albatros refinery at Antwerp, Belgium.

Official details of the deal were not immediately disclosed. But SN Repal and another French company, RAP, had been negotiating jointly with Albatros owners to run Saharan crude on a long-term lease basis. It was not learned immediately whether RAP is a partner in the present agreement.

SN Repal has half interest in Hassi Messaoud oil field in the French Sahara. Output from the big field has grown steadily and accounts for most of the 178,000 bbl. daily produced in Algeria. RAP has 51% interest in CREPS production in the Edjele area, which went on commercial production early in October. Both companies are controlled by the French Government.

"Albatros" Ste. Ame. Belge pour le Raffinage de Petrole is owned largely by private French and Belgium interests. But a British firm, Manchester Oil Refinery (Holdings), Ltd., has an 18% share.

SN Repal's move marks another effort by the French to develop foreign markets for their Saharan oil. CFP, which owns the other half of Hassi Messaoud field, is actively trying to develop foreign outlets through its marketing organization, Total. Since the start of the year, Total has formed a marketing subsidiary in Australia, obtained a crude sales contract in Japan, and decided to market gasoline under its own brand name in United Kingdom.

ENI Gets Soviet Crude in Barter Deal

RUSSIA will ship 12 million tons of oil daily to Italy in the next 4 years in exchange for steel pipe, pipeline pumping equipment, and synthetic rubber.

The shipments, averaging about 60,000 bbl. daily for the period, will be delivered to refineries at Porta Marghera, Beri, and Leghorn, in which the state agency, ENI, has an interest. ENI, along with a steel manufacturer, Finsider, were the two companies which signed the compact with Russia.

The oil will be carried from Black Sea ports in Italian-flag bottoms, which reportedly will result in cutting transportation costs in half in comparison with shipments to Italy from the Persian Gulf via the Suez Canal.

As the Italian part of the $200 million deal, Finsider will ship 240,000 tons of steel pipe to Russia. ANIC will supply 50,000 tons of europrene synthetic rubber from its Ravenna facilities, and Nuovo Pignone will supply pipeline equipment. Both ANIC and Nuovo Pignone are affiliates of ENI. Fiat will supply engines as part of the arrangement.

Shipments of Russian crude and products have grown steadily. Last year Italian imports of Black Sea crude rose to about 47,000 bbl. daily from 20,500 bbl. daily in 1958. Products imports were up to about 13,500 bbl. daily from 1,100 bbl. daily.

Turkey Stepout Looks Good

MOBIL INTERNATIONAL is completing a second producing well in the Bulgardag area in South Central Turkey less than half a mile south of the discovery.

Reports from Turkey indicate the stepout is a 2,000-bbl. daily producer with a 450-ft. oil pay. Mobil International in New York would not confirm the report. It said the tests on the well were not completed and that as yet there were no logs.

Depth of the well is 5,678 ft.

Bulgardag 1 tested 1,200 bbl. daily from about 4,700 ft. after acidizing and fracturing. Before treatment, drill-stem tests indicated a producing capacity of 240 bbl. daily. The crude is 36° gravity.

The find, one of the most promising ever made in Turkey, is 40 miles inland from Mersin, where a 65,000-bbl. refinery is under construction. Mobil has 56% interest in the plant.

The company says the find is "particularly important" because of Mobil's position as leading marketer in Turkey.

FOREIGN BRIEFS . . .

New synthetic-rubber projects will give a major boost to West Germany's present capacity of 160,000 tons per year. Bayer will build a plant for polybutadiene and polyisoprene production. Huels plans a 20,000-ton per year butadiene plant and will expand its polyvinyl chloride capacity from 50,000 to 80,000 tons. It will also increase polystyrol capacity to 30,000 tons per year, and propylene capacity to 3,600 tons per year.

A phthalic anhydride plant will be constructed at Villers-St. Paul, France, by Cie. Francaise de Matieres Colorantes (Francolor). The plant, licensed by Scientific Design Co., will use orthoxylene feed but will be able to readily convert to naphthalene.

A South West Africa concession of 90,000 sq. miles has been awarded to Etosha Petroleum Co., wholly owned subsidiary of Texas Eastern Transmission Corp. The rights cover all but a small portion of the country between the 21st parallel and the northern border. The nearest production is in Angola, which lies to the north. A preliminary geological reconnaissance program is now in progress.

Synthetic-rubber latices will be produced in England by a new company being formed by Witco Chemical Co. and U. S. Rubber Co. The joint firm, to be called Sto-Chem Ltd., will open a plant in the Midlands late next year.

Production of catalysts in West Germany will be undertaken by a joint company formed by Houdry Process Corp. and Chemische Werke Huels. The new company, Houdry Huels G.m.b.H., will operate a plant at Marl. Each partner will have 50% interest.

British railroads may go into the pipeline business. The British Transport Commission is studying the use of its right-of-ways for oil or chemical pipelines, and it has such a move under consideration.

A 20,000 bbl. U.O.P. Unifiner-Platformer is being built at Abadan refinery, by Fluor Engineering and Construction Co., London, for Iranian Oil Refining Co. The $5.6 million unit is scheduled to go on stream early in 1962.

Pemex reportedly is trying to convert $72 million in short-term loans from U. S. banks to longer, 12-year loans. The Mexican oil agency is believed depending on an improved credit rating to extend the loans at an interest of 5% or 6% per year.

PUBLISHER'S STATEMENT

The JOURNAL adds to its family

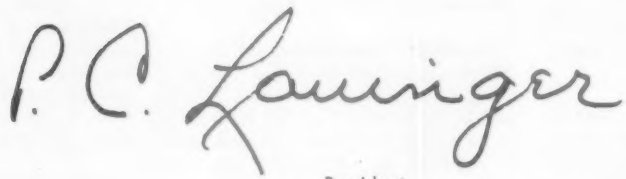
We take this opportunity to introduce OIL AND GAS INTERNATIONAL, the newest member of the growing family of oil-industry periodicals published by The Petroleum Publishing Co.

For years the editors of The Oil and Gas Journal have watched the amazing growth of the oil industry in western Europe, Africa, and the Middle and Far East. They have seen these areas develop their own special—and complex—problems.

OIL AND GAS INTERNATIONAL is the result of a long-standing conviction of these editors that there is a real need for a magazine devoted to the special problems in these areas. It is the product of years of research. It will focus on the economics, management, operating, and engineering problems common to the oil industry outside the Western Hemisphere.

We believe that members of the industry with special interests in the Eastern Hemisphere will find the fast-moving editorial concept, the easy-reading style, and the specific subjects discussed of commanding interest. The complexity of the oil and gas industry is such that OIL AND GAS INTERNATIONAL will contribute valuable and useful information not to be found in any other periodical.

This special section of The Oil and Gas Journal will be incorporated in a "pilot issue" of OIL AND GAS INTERNATIONAL. Regular monthly publication will begin in January 1961 with final editing, printing, and mailing from Amsterdam, Holland.



President
The Petroleum Publishing Co.

OIL AND GAS
INTERNATIONAL
A Special Report

Europe, North Africa:

Oil's Most Promising Provinces

Western Europe expands on

WESTERN EUROPE is heading for another 10 to 11% increase in consumption of petroleum products in 1960, maintaining the rate of growth experienced during the past 5 years.

Inland consumption this year is expected to be around 153 million tons of products, continuing the growth enjoyed as a result of the rapid increase in the demand for energy and the displacement of other major energy sources. Already the biggest single market open to world petroleum supplies, western Europe is likely to continue its big volume growth for several years, with the rate of growth gradually declining.

The region is experiencing growth in all phases of the oil industry:

... **Refinery construction** is at a boom level, with capacity increasing some 15% this year, moving toward self sufficiency in refining.

... **The second big crude-oil pipeline** is starting up, and another is ready to begin construction, tying in with the refinery expansion.

... **Imports**—especially of crude oil—are up sharply, also relating to the refinery and pipeline-building programs, as well as consumption growth.

... **Petrochemicals** are enjoying explosive growth with plant construction up 41% over 1959.

... **Indigenous production** of oil, although on a modest level, is also rising.

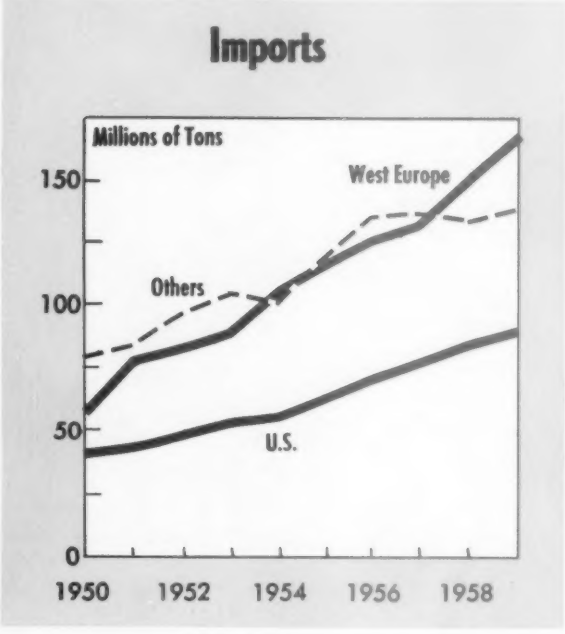
... **New supplies** are entering the picture, as Algeria became a substantial source for the first time this year, although the Middle East remains the dominant supplier.

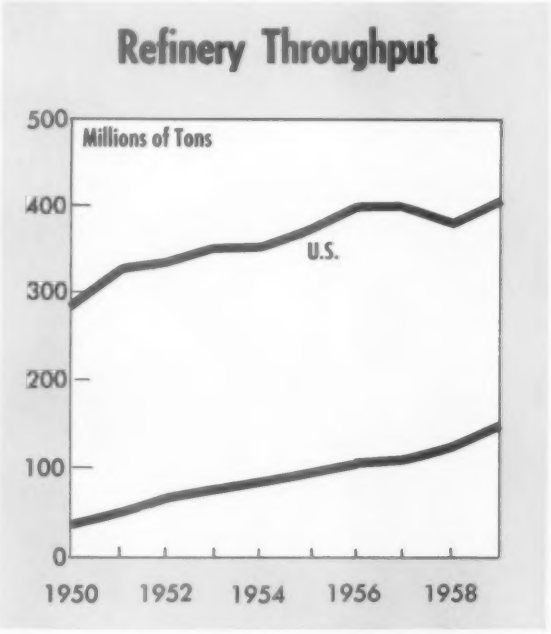
Refining and Petrochemicals

Western Europe's activity has a heavy emphasis on manufacturing this year. Refining capacity increased some 15%, roughly double the expansion of the previous year. Rated capacity was up some 25 million tons to more than 200 million tons per year as new plans or expansions were completed in France, Germany, the Netherlands, Italy, Norway, and the United Kingdom. New capacity in Germany exceeding 10 million tons doubled that opened by the United Kingdom and the Netherlands, although their growth was substantial, at 5 million tons per year each.

Some 24 million tons in new capacity is under way or planned mainly in France and Germany, but also widely distributed among other OEEC countries. Recent decisions to press forward with plans to extend the projected Marseille-Strasbourg-Karlsruhe pipeline into Bavaria will clear the way for refinery projects at several points on this system. It will enable the construction of the first refineries in Bavaria.

Huge outlays of capital are also being made in petrochemicals. Some 91 new construction projects were reported this year. The most popular products are the polyolefins, olefins, synthetic rubber, ammonia and urea, and carbon black. Plant activity is centered in France, Germany, Italy, the Netherlands, and the United Kingdom. Current projects will boost petrochemical investment to $1.2 billion, five times as great as for 7 years ago.





all fronts in 1960

- Crude production up 6% last year
- Reserves up 200-215 million tons
- Refinery construction up 15%
- Refining capacity up 15%

Supply and Demand

The 18 countries of the OEEC area grew faster last year than in the two previous years. Total supply of petroleum products had the biggest volume increase on record; it was up more than 18 million metric tons to 157.9 million. The total petroleum trade of OEEC countries, including shipments into, out of, and within the area, rose from 185 million tons to 200 million last year. Similar growth is indicated for 1960.

Inland consumption increased 11% last year, according to final figures, going up 13½ million tons to 139 million. Booming West Germany led the list with a growth of 24%, followed by the United Kingdom, 17%; the Netherlands, 15%; Austria, 15%; and France, Scandanavia, and Belgium, about 5% each.

Early figures indicate a continued high growth rate for West Germany and the United Kingdom. In the first half, United Kingdom consumption increased 18.7% over the same period of 1959, at 21,209,272 tons. Most products made good gains, fuel oil increasing 29%. The most spectacular gain was made by products destined for chemical feed stock and the gas industry, amounting to 62.9%, to reach 1,057,000 tons.

Fuel-oil consumption in West Germany was up 50% the first half. Motor fuel, aided by a sharp increase in the vehicle population in the spring, gained 20.7% the first half. West German consumption of all products is expected to be up 20% for the full year.

Western Europe's volume increase in consumption last year was second only to 1958, when the 19-million-ton growth was affected by the recovery from the Suez crisis. The area demand has been growing at an average of almost 13% since 1950.

Imports of crude oil are growing more rapidly than consumption, as OEEC countries approach self sufficiency in refining. Germany is an exaggerated example of the trend, with a twofold increase in 2 years. The 10.3 million tons of crude imports brought in during the first half of 1960 equalled the entire total for 1958.

As trade increases, stocks are building up steadily; this was reflected in the 5 million tons by which supply exceeded demand in 1959. A 17-million-ton increase in net crude-oil supplies last year boosted the total to 152 million tons, producing 140 million tons of products. Imports, principally from the Middle East, but also including substantial new supplies from Algeria, made up more than 90% of the crude supply. Trade volume is at a high rate so far this year, but new refineries and pipelines, with their inventory requirements, cloud the picture as to the actual demand.

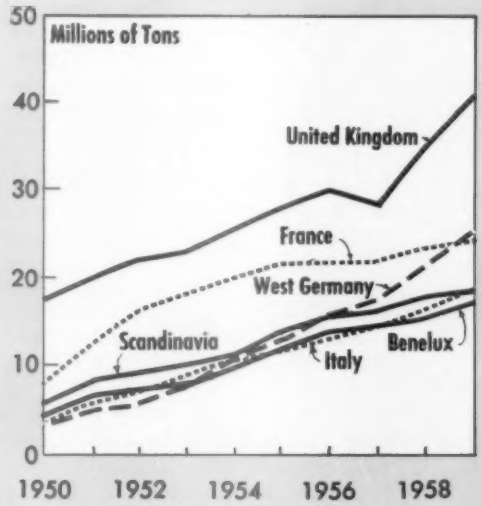
Production and Reserves

Western Europe's own crude production was up 6% last year to just over 13 million tons, and early figures this year point to a further gain in 1960. West Germany was up over 10% the first hafl.

North African production became a factor in the western Europe supply last year, as Algerian production reached 1.3 million tons, compared with 8,000 tons in 1957. Production in the early months of 1960 was at an annual rate of 5 million tons. With the opening of a second crude pipeline from Algeria this month, providing a large-volume outlet for the Edjele area, a further production impetus has been supplied. Next year, pipeline and terminal facilities on the Mediterranean will be readied to open two producing areas in Libya.

Western Europe reserves increased from 200 to 215 million tons last year. But the area's indigenous reserves are already dwarfed by the newly found fields of North Africa. Algerian reserves last year went up from 455 to 635 million tons compared to a 1959 reserve total of 300 million tons for the rest of Africa. These figures include only proved reserves, and are considered only the beginning, with a concerted exploratory effort just getting under way in an area that promises to become a major new source of petroleum. And the prime market for this oil will be western Europe.

Western Europe Consumption



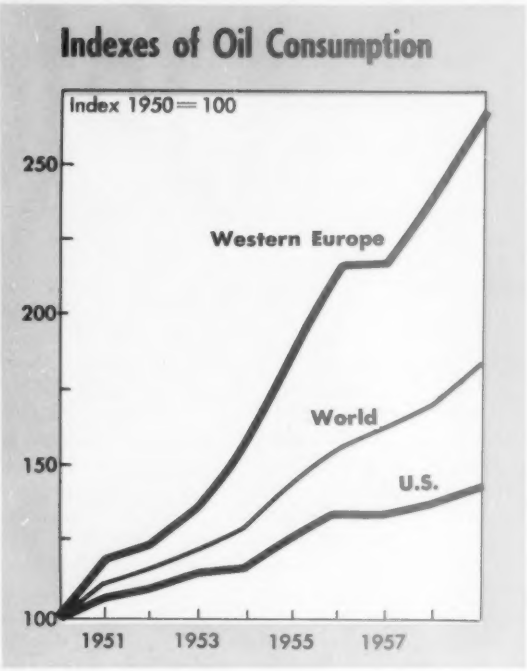


Fig. 1

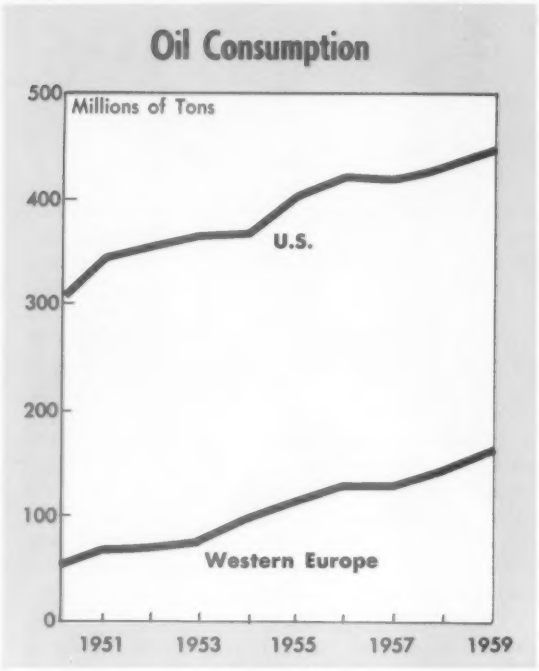


Fig. 2

Future of western Europe definitely

THE POSTWAR economic development of western Europe has opened a market for petroleum that has become second only to the United States.

And, without the advantage of the U.S.A in plentiful domestic supplies, western Europe has become the fastest growing of the world's major petroleum markets (Fig. 1).

Consumption increased 11% in 1959 (and is expected to enjoy a similar increase in 1960) compared with 6% for the entire world and 4% for the United States. Western Europe's rate of increase the past 5 years has been almost three times that of the U.S.A.

Although western Europe consumption is only about 40% of that of the U.S.A., its average increase on a volume basis the past 10 years has been almost 12 million tons compared to slightly over 17 million tons for the U.S.A. (Figs. 2 and 3).

The U.S.A. is a more mature petroleum and energy market, and petroleum is therefore more likely to grow in proportion to the gross national product. Western Europe, on the other hand, having only half the U.S.A. per capita energy consumption in its more advanced countries, is experiencing the type of rapid growth that the U.S.A. had some years ago.

Petroleum consumption in western Europe in the past 10 years increased 3½ times as fast as the demand for primary energy. It cannot, of course, continue to displace other energy sources at this rate, but a continuation of this general trend is foreseen for at least 15 years.

Here is the outlook for the western European economy, and the role of petroleum, between now and 1975:

. . . Gross-national-product increase of about 3% per year.

. . . Primary-energy demand increase of up to 65%.

. . . Petroleum demand to double, accounting for a steadily increasing share of the supply of primary energy.

. . . Imports will continue to supply some 90% of the petroleum requirements (Tables 3 and 4), with indigenous production growing steadily also.

. . . The proportion of crude-oil imports will increase from the level shown in Table 1, as the region acquires a larger refining capacity, while the proportion of products imports (Table 2) in the total supply declines.

. . . Natural-gas production will grow faster than indigenous crude (Table 3), and eventually will contribute as much as indigenous crude to the total energy supply (Table 4).

. . . Capital investment required to produce, transport, refine, and distribute western Europe's petroleum needs during 1955-75 will be $19,500,000,000, and for natural gas, $7,500,000,000, during this 20-year period (Table 5).

. . . A broader base of foreign supplies will develop, with North Africa and Russia beginning to provide important volumes, but the Middle East will remain the biggest single supplier in the forseeable future.

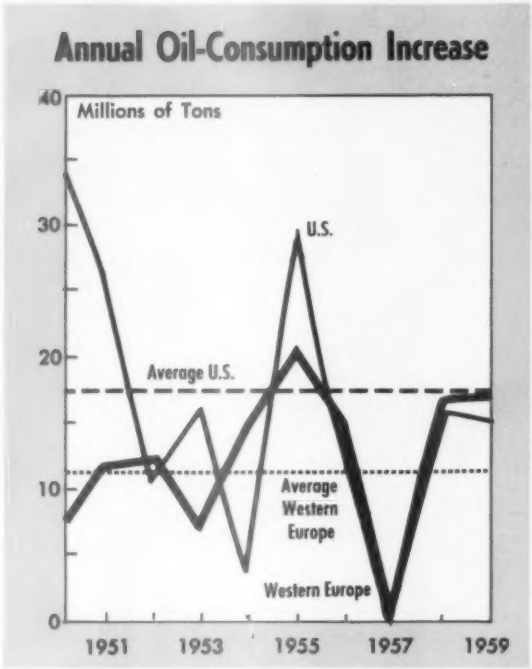


Fig. 3

tied to petroleum

The demand and investment figures are based on a study by the Energy Advisory Commission, Organization for European Economic Cooperation, which had access to the petroleum and energy forecasts of certain major oil companies. The forecasts assume that nuclear energy will supply no more than 10% of total requirements by 1975, and probably closer to 5%.

Petroleum vs. Coal

The wheels of European industry have historically been fueled by coal. In 1938, coal supplied 83% of primary energy. But the trend of prices the past 50 years has been against continued dominance by coal. Coal has been going up steadily, in relation to wholesale prices generally; the trend has continued since the end of World War II. Oil prices, in this period, have tended to increase at the same rate as wholesale prices generally.

This situation was thus ripe for the entry of another fuel if available in the right form, in large quantities, and at competitive prices. Petroleum was not prepared to assume this role until after the war. Before the war, indigenous crude production had not yet reached 1 million tons per year. Oil's share of the primary energy market was only 8%.

When both domestic and foreign supplies increased after the war, oil began to make rapid inroads into that two-thirds of the energy market that is open to free competitive substitution. As Europe moved from an energy-short to an energy-surplus area, competition in flexible markets heightened, and oil has had all the best of it. Coal's inability to improve production efficiency sharply has given oil most of the new market growth and some existing markets.

During 1949-58, oil consumption increased at 13½% per year, and doubled during the last 6 years of that period. This rate has slackened somewhat, but the high volume of growth has persisted. Barring a shortage of oil imposed by international crisis, or much more efficient production of competing fuels, oil will no doubt win a steadily larger share of the market for primary energy. The OEEC forecast anticipates growth for petroleum starting from 8% of the energy market in 1938, and 25% in 1958, to 31% in 1965 and 37% in 1975.

Western Europe Production

Crude oil. Production of sizable volumes of crude oil is a post-war phenomenon in western Europe. The prewar level of less than 1 million tons per year was expanded rapidly, reaching 13 million tons last year, and increasing more than fivefold in the past 10 years.

Most of the production is in Austria, West Germany, France, Italy, and the Netherlands. (See Table 1.)

Figures for the early part of 1960 showed a trend toward increasing production, and that is the long-term expectation. But several question marks surround any forecast figures.

Capital requirements for deeper wells have become quite large, and have tended to reduce the total of wells drilled. All of the domestic production does not always have a ready market, in spite of Europe's dynamic demand, because it must compete with imports. Thus the domestic industry's ability to generate its capital needs is impaired. Western Europe must also compete with other, more attractive, exploratory regions for the capital of the international companies.

Nonetheless, expansion of indigenous production to 20 million tons in 1965 and 35 million tons in 1975 is forecast for metropolitan Europe.

Natural gas. The development of natural gas, as might be expected, has paralleled that of oil, being insignificant before 1939 and rapid after 1946.

Production has increased from 50 million cubic meters in 1938 to more than 10 billion cubic meters in 1959. Last year's output exceeded 1958 by one-third. Italy is by far the largest producer, accounting for 60% of the OEEC area total, but France is making progress in developing the vast reserves at Lacq and last year produced 25% of the area total.

Natural gas is very successful at pushing its way into new markets. With this ability, plus a high ratio of reserves to production (estimated 65-year life in 1958), production is expected to increase substantially, to 20 billion cubic meters in 1965 and 40 to 45 billion cubic meters in 1975.

Imported Supplies—Crude Oil

The requirements for imports of petroleum are placed by OEEC at the equivalent of about 220

Table 1—OEEC Europe 1959 Oil and Gas Statistics

(Unit, thousands of metric tons)

Countries	Natural Gas: Indigenous Production (in million cu. m.) 1	Crude Oil: Indigenous Production (incl. shale oil) 2	IMPORTS§ ¶ From: $ Sources: Middle East 3	$ Sources: Elsewhere 4	Non-$ Sources: Middle East 5	Non-$ Sources: Elsewhere 6	Total Imports (3+4+5+6) 7	Total Supply (2+7) 8	Total§ ¶ Refinery Throughput 9
Austria	1,030	2,459	.....	.....	.....	452	452	2,911	1,876.5
Belgium	.....	.....	1,953	204	4,377	147	6,681	6,681	6,558
Luxembourg	.....	.....	.....	.....	.....	.....	.....	.....	.....
Netherlands	*180	1,773	3,109	.....	7,794	3,971	14,974	16,647	16,621
Denmark	.....	.....	.....	.....	.....	37	37	37	35
France	2,614	3,092	6,438	1,807	18,372	1,009	27,626	30,718	30,766
Germany	388	5,119	7,300	1,870	6,421	1,135	16,726	21,845	21,737
Greece	.....	.....	1,200	.....	.....	300	1,500	1,500	1,450
Iceland	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ireland†	.....	.....	187	.....	566	23	770	770	600
Italy	6,118	‡1,755	12,222.3	2,570.8	9,824.7	286.3	24,904.1	26,659.1	26,378
Norway	.....	.....	.....	106	.....	.....	106	106	99
Portugal	.....	.....	768.5	15	277.4	201	1,261.9	1,261.9	1,246.6
Sweden	.....	86	56	374	1,992	142	2,564	2,650	2,663
Switzerland	.....	.....	.....	.....	.....	.....	.....	.....	.....
Turkey†	.....	365	.....	.....	.....	.....	.....	.....	362
United Kingdom	.....	146	.....	901	31,682	7,613	40,196	40,342	39,326
Spain	.....	75.6	n.a.	.....	n.a.	.....	4,154.9	4,230.5	4,230.5
Total	**10,330**	**14,870.6**	**33,233.8**	**7,847.8**	**81,300.1**	**15,316.3**	**141,852.9**	**156,723.5**	**153,948.6**

*Estimated. †Secretariat's estimate. ‡Including natural gasoline. §Process oils included. ¶Including quantities imported on agency basis.

million tons of crude in 1965 and 345 million tons in 1975. This assumes that there will be no unusual increase in the relative price of oil.

With the present substantial world-wide surplus, and prospects for expanding supplies, the oil companies expect to have no trouble in meeting western Europe's rising demand.

The more interesting question is which exporting countries will win a share of the market, and how much that share will be. The Middle East now supplies some 80% of western Europe's crude-oil imports. Having approximately 60% of the world's reserves, this region will continue as the dominant supplier.

But Algeria, owning major newly discovered reserves and being closely integrated with the economy of France, will shortly become a substantial supplier. Algeria supplied more than a million tons last year, and this volume will soon multiply several times. Production and transportation facilities will within 2 years place Libyan fields in a position to enter the European market in a big way. Geography, as well as national policy, in the case of Algeria, will work toward rapid growth in exports from North Africa.

Table 3—Potential Petroleum Supplies, Western Europe

	1959	1965	1975
Petroleum (millions tons)			
Indigenous production (including shale oil)	15	20	35
Imports	142	200-240	300-390
Natural gas (billion cu. m.)			
Indigenous production	10	20	40-45
Imports (national)	..	0.5	0.5-3.0

Russian role. The other major new supplier is the Soviet bloc, mainly Russia, which, until recently,

Table 4—Total Demand and Potential Supplies of Primary Energy, OEEC Europe

(Millions of tons of coal equivalent)

	1955	1965	1975
Estimates of total demand for primary energy	777	970-1,050	1,225-1,425
Mean of estimates	777	1,010	1,325
Potential indigenous supplies			
Coal	477	440-480	430-495
Lignite	30	45	60
Crude oil	13	30	50
Natural gas	7	25	50-60
Hydropower	56	95	140
Nuclear energy (most fuel imported)	...	15-20	30-90
Other forms of energy	20	20	20
Total	603	670-715	780-915
Mean of estimates	603	690	850
Potential imported supplies			
Oil	146	260-310	380-500
Natural gas	...	5	10-75
Coal	28	10-60	10-60
Total	174	275-375	400-635
Mean of estimates	174	1,015	1,365
Total potential supplies	777	945-1,090	1,180-1,550
Mean of estimates	777	1,015	1,365

Table 2—Supply and Disposal of Finished Petroleum Products, OEEC Europe, 1959

(Unit, thousands of metric tons)

Countries	Supply: Total† Refinery Output (incl. shale oil output) 1	Supply: Imports From: Non-$ Sources: Other Fuels 2	Supply: Imports From: Non-$ Sources: $ Sources 3	Supply: Imports From: Non-$ Sources: Participating countries 4	Supply: Imports From: Non-$ Sources: Others 5	Supply: Imports From: Non-$ Sources: Total (3+4+5) 6	Supply: Total Supply (1+2+6) 7	Disposal: Deliveries to Inland Consumption 8	Disposal: Total Bunker Deliveries (ocean-going vessels all flags) 9	Disposal: Exports to:†: Own overseas territories 10	Disposal: Exports to:†: Others 11	Disposal: Total Disposal (8+9+10+11) 12
Austria	1,816.7	18.3	3.3	447.3	478.4	929	2,764	2,524.7	.....	.....	178.9	2,703.6
Belgium	6,228	65	642	2,439	310	3,391	9,684	5,989	671	4	2,719	9,383
Luxembourg	.....	.....	20.1	177.1	.....	197.2	197.2	195.3	.....	.....	0.5	195.8
Netherlands	14,991	.....	204	2,383	2,573	5,160	20,151	7,310	1,773	.....	10,964	20,047
Denmark	36	108	980	3,333	114	4,427	4,571	4,405	322	.....	.....	4,727
France	27,931	597	128	973	1,080	2,183	30,711	20,895	1,677	2,130	4,026	28,728
Germany	19,958	568	718	3,186	2,288	6,192	26,718	23,049	1,847	.....	1,619	26,515
Greece	1,378	.....	19	458		477	1,855	1,672	167	.....	8	1,847
Iceland	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ireland	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Italy	24,786.3	.....	110.6	82.9	752.8	946.3	25,732.6	15,107.5	2,435	.....	8,318.7	25,861.2
Norway	95.5	.....	907.1	2,203.2	136.7	3,247	3,342.5	3,052.4	328.5	.....	13.9	3,424.8
Portugal	1,173.4	.....	223.3	18.2	256.1	497.5	1,670.9	1,216	345.2	103.3	217.3	1,881.8
Sweden	2,546	.....	1,878	5,618	1,486	8,982	11,528	10,582	418	.....	127	11,127
Switzerland	.....	3	43.1	3,069.1	221.1	3,333.3	3,336.3	3,296.6	12.6	.....	.....	3,309.2
Turkey	337	.....	1,198.5	.....	10	1,208.5	1,545.5	1,395.4	.....	.....	.....	1,395.4
United Kingdom*	35,304	337	3,626	3,442	6,120	13,168	48,809	33,825	4,124	116	8,337	46,402
Spain	3,929.4	.....	119.1	.....	763.4	882.5	4,811.9	4,538.5	143.1	.....	57.8	4,739.4
Total	140,510.3	1,696.3	10,820	27,811.8	16,589.5	55,221.3	197,427.9	140,233.4	14,263.4	2,353.3	36,667.1	193,517.2

*Including military use. †Including quantities imported on agency basis. ‡Process oils included.

has been inconsequential in the world market. This situation no longer prevails.

Russian oil exports have increased from slightly over 4 million tons in 1953 to 18.1 million tons in 1958 and 25.4 million tons in 1959. Of these totals, 9.5 million tons entered free-world markets in 1958 and 14.5 million tons in 1959. Two-thirds of the volume to noncommunist countries in 1958 went to western Europe, and three-fourths in 1959. The trend is for another sizable increase this year.

Within 3 to 5 years, Russia is expected to have an additional 100 million tons of oil at her disposal. How much will be required for internal consumption, or how much Russia will choose to export, remains to be seen. But it is clear that Russia, as a matter of national policy, intends to expand exports for two purposes: (1) she needs to finance increasing imports of goods, and oil is the marketable commodity that she has available in quantity, and (2) oil can be used effectively to advance her political ends, as is the present case in Cuba.

Russia's concentration on western Europe is inevitable. Here is the market which also has the finished goods that she needs for exchange. Russia has undercut world prices, where necessary to make a deal, and helps to offset this by charging higher prices to communist customers, according to published trade figures.

Last year Russia exported oil to 30 free-world and 11 communist countries. When the exports of Soviet bloc nations are added, exports from these sources to the free world amounted to 16¾ million tons last year. Of this, 12½ million tons was sold in Europe.

The United Kingdom is the lone major oil consumer of the region to resist Soviet sales efforts; Ireland, Portugal, and Spain also turned Russia down.

The Soviets have taken over the markets in Finland and Iceland. Their biggest single market last year was Italy, with 3.1 million tons.

By restricting the passenger-car population at home, and by using lower-grade fuels for power generation and in locomotives, Russia will be in a position to export increasing volumes. And Europe will continue to be the prime target.

If forecasting in general is a hazardous undertaking, the phase relating to importing natural gas is the most uncertain of all aspects considered here.

The OEEC study group assumes that some imports of natural gas are definite. The technical feasibility of transporting liquefied methane by tanker has been proved. And considerable effort is being directed at making available the major new Saharan reserves to markets in Europe, either via tanker or pipeline across the Mediterranean.

Table 5—Capital Investment in Energy

(Billions of dollars, 1955 prices. Data OEEC)

	1955-65	1965-1975: Moderate Nuclear Develop.	1965-1975: Rapid Nuclear Develop.
Coal	3.0	3.5	3.5
Liquid fuels			
Imported	6.0	8.0	8.0
Indigenous	2.0	3.5	3.5
Coke and manufactured gas	3.5	3.5	3.5
Natural gas			
Indigenous	2.0	3.0	3.0
Imported	0.5	2.0	2.0
Electricity			
Thermal	7.5	13.5	10.0
Hydro	9.0	10.5	10.0
Nuclear	3.0	1.5	8.5
Transmission and distribution	16.0	22.0	22.0
Others	5.0	5.0	5.0
Total	57.5	76.0	79.0

NATURAL-GAS DICOVERY, access to water transportation, and plenty of available land area led to the establishment of this large petrochemical center at the Italian village of Ravenna.

U.S.-European technology combine to make butadiene from methane

• The large ANIC petrochemical complex in Italy uses a unique combination of processes. Principal feed stock is methane. This plant makes butadiene via acetylene and acetaldehyde. Offgases from acetylene go to ammonia manufacture. End products include SBR rubber and fertilizers. A new butane dehydro unit implements butadiene production. Further diversification is under way.

BY JOHN C. REIDEL
Ente Nazionale Idrocarburi
Milano, Italy

THE KEY TO RAVENNA is methane. The discovery in Italy of natural gas (nearly pure methane) in an area so close to the Adriatic Sea led to a new concept of processing for manufacture of synthetic rubber and corollary production of nitrogenous fertilizers. The individual processes are not new, but their combination is unique.

This combination was evolved after careful study by the technical personnel of ANIC. ANIC is one of five major subsidiaries of the Italian hydrocarbon corporation, ENI (Ente Nazionale Idrocarburi). ENI is a large integrated organization engaged in all phases of producing, processing, and distributing natural gas and petroleum.

Background of Process

To the American reader who is not acquainted with Italian conditions it may seem odd to begin with methane and then proceed to make butadiene through condensation of acetaldehyde and ethanol—a process based on the early chemistry of Lebedev and Ostromisslensky. The United States has a concentration of large refineries, particularly on the Gulf Coast, providing a plentiful supply of refinery butylenes for the steam dilution process.

It also has a large natural-gas-liquids industry from which butane can be obtained for the one-step Houdry dehydrogenation process. U. S. production of butadiene is roughly 50% from refinery butylene and slightly over 40% from butane, with the remainder coming as byproduct from ethylene cracking.

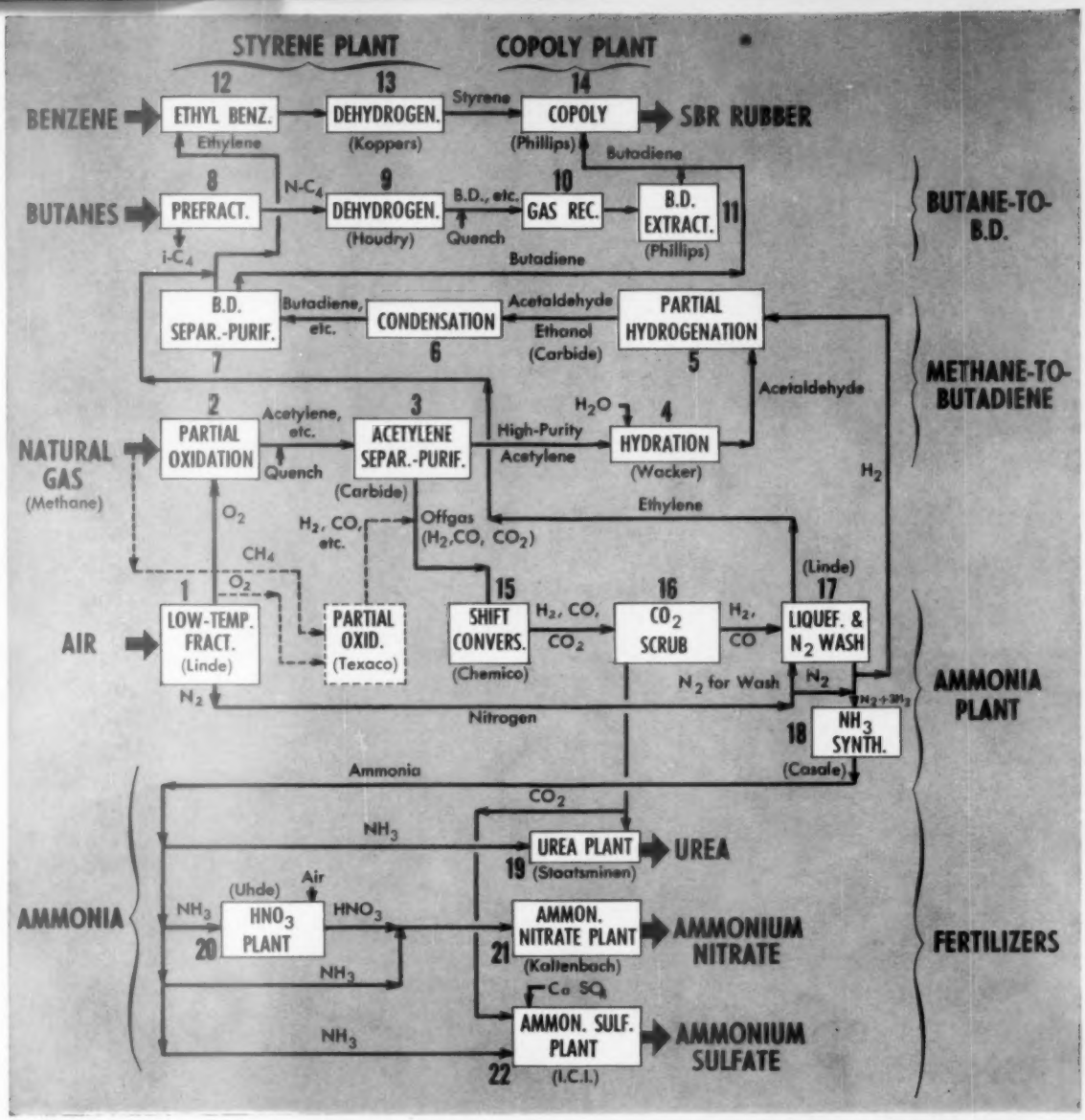
In Italy, however, the refineries until now have been relatively small and scattered over the Italian peninsula; and total available butylenes are insufficient. Therefore, a different approach was imperative. This approach was made possible through the discovery of natural gas near Ravenna.

During World War II roughly two-thirds of butadiene production in the United States was based on petroleum and the remainder was alcohol - derived. The process from alcohol was commercialized by Carbide Chemical Corp. during 1941-42. ANIC has combined portions of the Carbide process with the German Wacker process (which converts acetylene into acetaldehyde). By doing this, it became possible to upgrade an important national resource in an economically attractive manner. Conversion of methane to acetylene is by a modified Sachsse process as developed by Carbide at its Texas City, Tex., plant after World War II.

Location

Site of the ANIC plant is a few miles from Ravenna along the Candiano (Corsini) Canal leading to the Adriatic. Ravenna was formerly a sleepy little town attractive to tourists for its famed Byzantine mosaics. It well merited the name of "La Bella Addormentata"—The Sleeping Beauty. Location of the large ANIC plant here has given an economic uplift to the whole area.

Why Ravenna? The following factors favored location of the plant at Ravenna: (1) Existence of the methane



RAVENNA PLANT consists generally of a cold box for separating air, a main organics section, a butane dehydrogenation section, and an inorganic section.

gas field close by, (2) the Corsini waterway which facilitates movement of raw material and products, (3) the 500-acre site which consists of low-grade land and so that no valuable agricultural land is lost, (4) ample water available from the Reno River, and (5) gypsum, required for ammonium sulfate production, which is found near Ravenna.

Water transportation. With egress to the Adriatic, sea transportation can be used to reach southern Italy, other Mediterranean countries, and also the Middle East. Work is being done to: (1) widen and deepen the canal so that vessels up to 15,000-ton capacity can be handled, and (2) enlarge facilities at the Port of Ravenna.

ANIC Process Scheme

The summary flowsheet indicates the principal steps in the complex processing which is characteristic of a large plant of this type. As arranged on this flowsheet, the plant consists of: (a) Linde cold box for **low - temperature fractionation of air,** (b) the main **organics section**—methane to butadiene by steps 2-7 inclusive, (c) the new **butane dehydrofurfural extraction** section indicated in steps 8-11 inclusive, (d) **inorganic** section comprising hydrogen purification, ammonia synthesis and fertilizer manufacture all as indicated by steps 15-22.

The **urea** plant is also a new addition. a large **complex fertilizers** plant is in operation, although not indicated on the flowsheet.

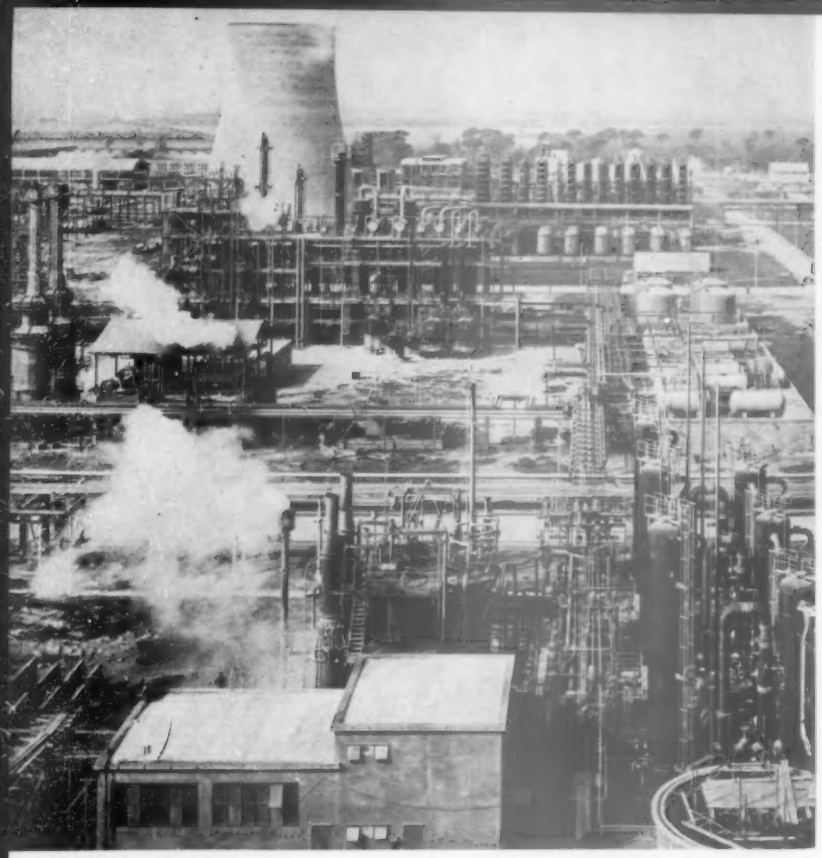
Capacity of SBR rubber is now more than 80,000 metric tons and will be soon over 90,000 tons annually. Capacity of fertilizers is over 1,000,000 tons.

Air fractionation. The twin Linde low-temperature air fractionation units are operated at low pressure. They are capable of producing 98% pure oxygen and 99.9+% nitrogen. A nitrogen expansion turbine and other features are incorporated in the Linde cycle to reduce energy consumption. The pure oxygen from the cold box is employed for partial oxidation of methane.

The highly pure nitrogen is used in the ammonia plant for liquid nitrogen wash as the final step in hydrogen purification; and then more nitrogen is added before going to the ammonia synthesis section.

Methane to Acetylene

Methane is partially oxidized with



BUTADIENE PRODUCTION is supplemented by dehydrogenation of butane obtained from several refineries.

high-purity oxygen. This is a high-velocity, short-residence-time flame reaction, followed by a quick quench. Certain features of the process have been published earlier while others are unfortunately subject to security and so cannot be described here.

Acetylene purification. Products of reaction are acetylene, H_2 and CO, and other impurities. Acetylene purification is accomplished by successive absorption steps to separate in order: (1) heavier components such as benzene, naphthalene, diacetylene, vinyl acetylene, etc., (2) lighter components such as methyl acetylene, propadiene, etc., (3) the acetylene itself from the offgas (H_2, CO, and CO_2). The offgas is routed to the ammonia plant. The acetylene is then separated from the solvent in successive steps to yield 99.8%-purity acetylene.

Acetylene to Acetaldehyde (Wacker)

For this conversion (step 4 on flowsheet), the high-purity acetylene is compressed and goes to two reactors in parallel. The catalyst consists of an aqueous slurry of mercuric sulfate with metallic mercury and ferric sulfate. The acetylene is bubbled through the suspension and partly converted to acetaldehyde. A small amount of byproducts — chiefly crotonaldehyde and acetic acid—is also formed.

Acetaldehyde purification. The reactor effluent therefore consists of acetaldehyde, unreacted acetylene, water vapor, and the byproducts. Acetaldehyde is removed by absorption in water. Unreacted acetylene is recycled. The acetaldehyde is now purified by (1) distillation of acetaldehyde solution to remove the water, (2) separation of the crotonaldehyde, and (3) condensation of the acetaldehyde and desorption of small amounts of acetylene carried over during the absorption with water.

Acetaldehyde to Butadiene

Steps 5 and 6 (flow sheet) are accomplished by the Carbide process. First, partial hydrogenation of acetaldehyde produces a mixture of acetaldehyde and ethyl alcohol. Then a condensation reaction between the acetaldehyde and ethanol results in the formation of butadiene. Tubular reactors are employed at Ravenna for both of these steps.

The partial hydrogenation reaction is exothermic. Dowtherm is circulated over the reactor tubes as a coolant to regulate reaction temperature. The heat absorbed by the Dowtherm is then transferred to waste-heat boilers.

To make butadiene, ethanol and acetaldehyde vapors are passed through the tubes over silica-gel impregnated with tantalum oxide. Since the condensation reaction is endothermic, hot Dowtherm is passed over the tubes to supply heat of reaction. In the condensation reaction two moles of water are formed for each mole of butadiene.

BD purification. The reactor effluent from step 6 contains butadiene, unreacted ethanol and acetaldehyde, and a large number of byproducts consisting mostly of ethylene, butylene, ethyl ether, heavier unsaturated hydrocarbons, and oxygenated compounds. This requires a number of absorption and distillation steps to obtain the highly pure butadiene required for copolymerization with styrene. Ethylene recovered in the purification (step 7) goes to the styrene plant.

New Butane-to-Butadiene Plant

A Houdry butane dehydrogenation unit has just been completed together with a Phillips Petroleum Co. furfural extractive distillation plant for butadiene finishing. The reactor section capacity (design) is over 20,000 tons per year butadiene.

Houdry dehydro. Three reactors are used at Ravenna to effect the one-step dehydrogenation of butane to butadiene. The reactors operate on a react-purge-regenerate cycle controlled by a cycle timer. One reactor is on stream, another undergoes purging and valve changes, while the third is being regenerated with preheated air.

Butane comes from several refineries. The butane goes to a prefractionation section to separate isobutane. The 95% n-butane is fed to the reactors together with butane-butene recycle from the furfural-extraction section. Butane is first vaporized by exchange with hot quench oil and then is superheated in a heater before entering one of the reactors.

The reactor effluent (butadiene together with butenes, unreacted butane, and a small amount of hydrogen, methane and other products) undergoes an oil quench in two stages. The quench oil is recirculated and cooled by exchange with feed butane. The effluent then is compressed and goes to the gas-recovery section where hydrogen and hydrocarbons lighter than propane are separated.

Butadiene extraction. The C_4-concentrate from gas recovery goes to a butylene splitter. This takes overhead a mixture of butadiene and lighter (mainly butene-1) and some butene-2's. The bottoms from the butylene splitter include most of the butene-2's and the butane and heavier, and this stream is recycled to the reactors.

The overhead is fed to a butadiene

ANIC'S RAVENNA PLANT converts almost pure methane into SBR synthetic rubber and fertilizers.

solvent tower where furfural-extractive distillation takes out butadiene and some butene-2's which leave in a furfural solution as bottoms; the butene-1 overhead stream (mainly butene-1, isobutane, and isobutene) from the solvent tower is recycled to the dehydrogenation section.

The butadiene-furfural solution bottoms go to a solvent stripper where butadiene and the residual butene-2's are stripped from the furfural. The latter is returned to the solvent tower. Butadiene is finished in a rerun tower where the residual butene-2's are removed as bottoms.

Styrene manufacture. Styrene is made under Koppers Co. license using: (1) the Friedel - Crafts reaction of ethylene and benzene, in which the catalyst is aluminum chloride, with ethyl chloride to provide the HCl promoter, and (2) dehydrogenation of ethylbenzene to styrene.

Benzene comes from outside sources and ethylene, as noted, from the butadiene separation section (step 7 on flowsheet), and also from the hydrogen purification (step 18).

The ethylbenzene dehydrogenation is accomplished catalytically, using superheated steam which supplies the heat and acts as a diluent. The styrene is separated from the other reactor products by low-pressure distillation.

Copoly operation. In the copolymerization plant the Phillips Petroleum Co. "cold" process is used to obtain a superior rubber. Ammonia refrigeration provides the required low temperature. Styrene and butadiene are copolymerized in an aqueous emulsion in the presence of a complex catalyst mixture.

Residual styrene and butadiene are removed from the resulting latex, antioxidants added, the suspension coagulated and (following dewatering) the rubber is pressed into blocks. Butadiene recovered here is piped back to the furfural-extraction section. A cis-polybutadiene plant and various rubber and latex plants are now under construction.

Inorganic Plants

Primary feed for ammonia manufacture is H_2 and CO in the offgas from acetylene manufacture. The ammonia plant proper has a capacity over 750 metric tons per day of anhydrous ammonia. However, a Texaco partial-oxidation plant acts as a standby to supply hydrogen from methane if the acetylene plant is not operating or to supplement ammonia production if necessary. There are two Texaco units, each with capacity of 120-150 metric tons per day.

Making ammonia. The acetylene offgas contains hydrogen, carbon monoxide, carbon dioxide and other components such as CH_4, C_2H_6, C_3H_8, etc.

Steps in ammonia manufacture are:

1. The CO undergoes a shift conversion with steam to obtain additional hydrogen and the more easily removed CO_2.

2. The CO_2 is removed by water scrub at 12 atm. A Francis-type turbine is used here to recover power. The CO_2 goes to urea manufacture, with a portion routed to the ammonium sulfate plant. The water scrub is followed by a caustic wash.

3. In another Linde cold-box unit (step 17) a low-temperature cascade system is employed to remove (by liquefaction) C_3-and-heavier, C_2's, and methane. The ethylene removed here goes to ethylbenzene manufacture (step 12). The hydrogen is obtained in high purity by a liquid nitrogen wash which also removes CO and residual methane.

Some of the hydrogen is supplied for the hydrogenation of acetaldehyde to ethanol (step 5 of the organics section). The CO and CH_4 go to plant fuel.

4. Additional nitrogen is added to the hydrogen stream to obtain the stoichiometric ratio for ammonia synthesis.

5. Synthesis is carried out by the Casale process at 450 atm.

Nitrogenous fertilizers. A portion of the ammonia is used to make nitric acid by pressure oxidation for manufacture of ammonium nitrate.

For production of ammonium sulfate a process, never used before on a large scale in Italy, is employed. It uses gypsum, which is obtained from deposits near Ravenna. Carbonation of ammonia solution yields ammonium carbonate and this is reacted in a double exchange with the $CaSO_4$ to make ammonium sulfate.

New urea plant. Latest addition to the fertilizer sector at Ravenna is a urea plant using the Netherlands Staatsminen process. Urea manufacture involves reaction of CO_2 and NH_3 to make ammonium carbamate, a portion of which is converted to urea.

CONTROL ROOM at Wilhelmshaven, starting point of 230-mile, 28-in. North West Oil Pipeline's crude line to Cologne.

Pipelines play key role in European growth

Frontiers no problem with creation of a common market

BY GENE KINNEY
East Coast Editor

PIPELINES will be the dominant means of transport of crude oil for inland refineries of western Europe by 1963, although the first major crude line didn't start operating until last year.

The sudden rise in the importance of pipelines is coincident with Europe's rapid increase in demand, the move of refineries to consuming centers in the interior, and the trend to larger tankers, which can be handled at only a few ports.

Pipelines can most economically move these large volumes, and with the creation of a common market in western Europe, it is possible for international pipelines to cross frontiers.

Gas pipelines are coming into prominence also, permitting exploitation of new discoveries. Europe is devising imaginative schemes to tap Algerian gas.

Russia, too, is resorting to pipelines to overcome the handicap posed by its huge land mass and the great distance of oil fields from warm-water ports and markets in eastern Europe. This obstacle is spurring Russia to undertake the biggest project in Europe in order to increase exports to satellite—and perhaps free-world—countries.

Crude-Oil Pipelines

The origin of crude-oil pipelines in western Europe is influenced largely by the availability of deepwater ports. There are three ports on the continent which can accommodate tankers up to 100,000 dw. tons. Wilhelmshaven, Rotterdam (Europort), and Le Havre. Expanded facilities at Lavera, France, near Marseille, may soon put this port into the top class.

Genoa cannot as yet accept anything over 30,000 dw. tons. Venice is limited to tankers of 50,000 dw. tons or less.

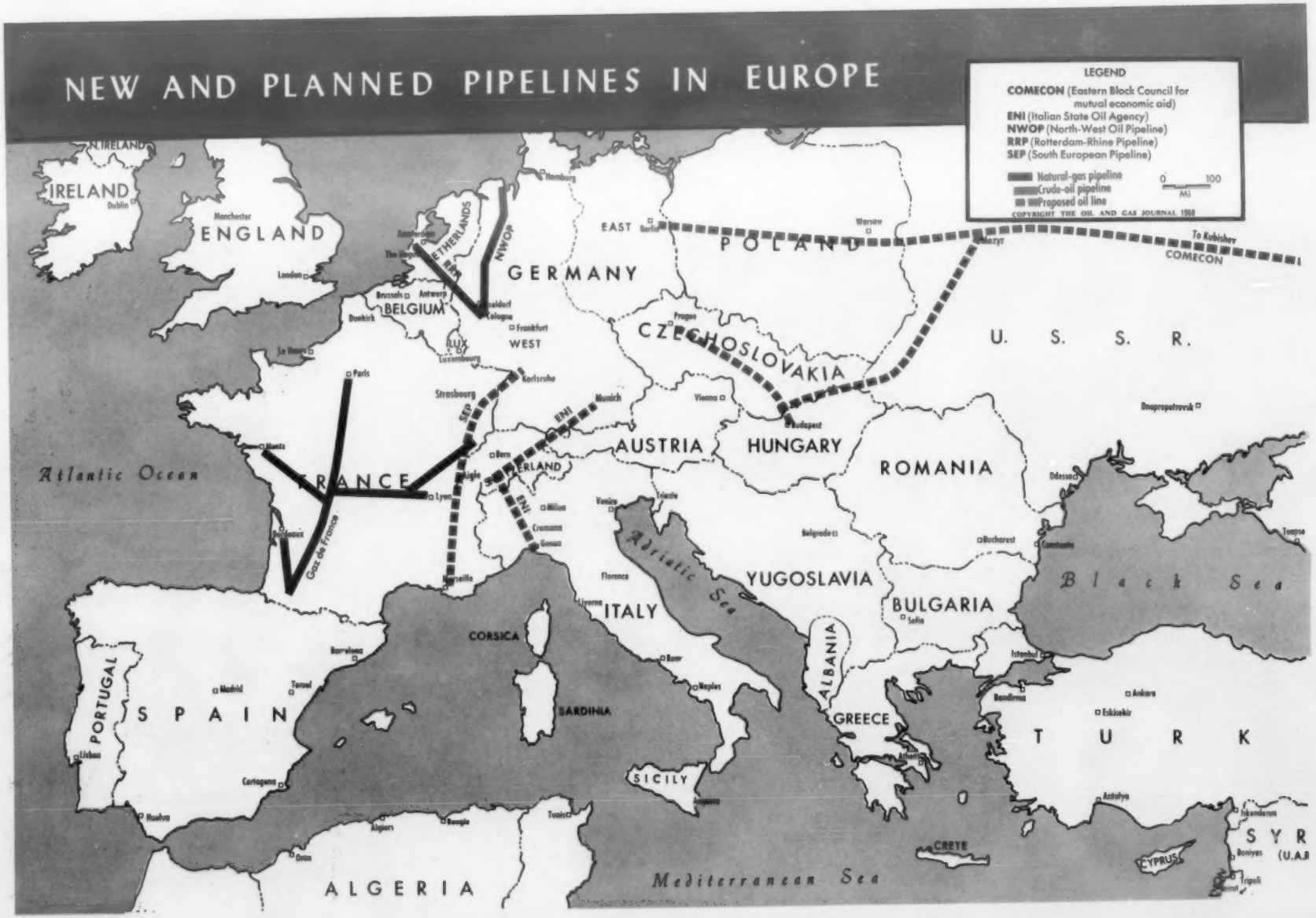
All of these ports are pipeline terminals, actual or planned. Wilhelmshaven is the originating point for North-West Oil Pipeline, Rotterdam for Rotterdam - Rhine Pipeline, and Lavera for the proposed South European Pipeline.

The key role of these pipelines in transporting crude oil to refineries is emphasized in Table 1. The last three plants listed were formerly supplied by barges on the Rhine.

North-West Oil Pipeline. This is Europe's first major crude pipeline, a 230-mile 28-in. system from Wilhelmshaven to Cologne built at a cost of $46,000,000.

In its first year of operation last year, the line carried 5,300,000 tons—or 106,000 bbl. daily—of crude oil to refineries, almost one-third of all the oil imported by West Germany. Opening of the system immediately made Wilhelmshaven the country's leading port, ousting Hamburg from that position.

The throughput rate will increase to 9,000,000 tons—or 180,000 bbl. daily—by the end of 1960. Next year capacity may be increased to 15,000,-


NEW AND PLANNED PIPELINES IN EUROPE
LEGEND
COMECON (Eastern Block Council for mutual economic aid)
ENI (Italian State Oil Agency)
NWOP (North-West Oil Pipeline)
RRP (Rotterdam-Rhine Pipeline)
SEP (South European Pipeline)
Natural-gas pipeline
Crude-oil pipeline
Proposed oil line
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HUNGARY
ROMANIA
Atlantic Ocean
Nantes
FRANCE
Bern
SWITZERLAND
Milan
Venice
Trieste
Odessa
Bordeaux
Gaz de France
Lyons
Marseille
Cremona
Genoa
Adriatic Sea
Belgrade
Bucharest
Constanta
Black Sea
YUGOSLAVIA
BULGARIA
Florence
Livorno
ITALY
Sofia
CORSICA
Barcelona
Istanbul
ALBANIA
PORTUGAL
Madrid
Teruel
SPAIN
Rome
Naples
SARDINIA
GREECE
Bandirma
Ankara
Eskisehir
T U R K
Lisbon
Cartagena
SICILY
Athens
Antakya
Nueva
Algiers
Bougie
Tunis
Oran
CRETE
CYPRUS
Beirut
Tripoli
ALGERIA
Mediterranean Sea

Table 1—Major Western Europe Refineries Supplied by New Pipelines

Refinery	Capacity (tons/year)	Pipeline	Status
BP Dinslaken	4,400,000	North-West	On stream
Esso Cologne	3,400,000	North-West	On stream
Shell Godorf	4,000,000	Rotterdam-Rhine	On stream
Purfina Duisburg	1,000,000-3,000,000	North-West	On stream
Bavarian Refineries	(proposed)	South European	1963
Oberrheinische Mineralowerke Karlsruhe	3,000,000	South European	1963
Esso Karlsruhe	4,000,000	South European	1963
Erdoel-Raffinerie Lingen	1,000,000	North-West	On stream
Gelsenberg Gelsenkirchen	4,400,000	Rotterdam-Rhine	On stream
Scholven-chemie Gelsenkirchen	2,000,000	North-West	On stream
Union Rheinische Braunkohlen Krafts-off Wesseling	3,000,000	North-West and Rotterdam-Rhine	On stream

000 tons and in 1963 to 20,000,000 tons (400,000 bbl. daily) by installing three pump stations in addition to the originating station at Wilhelmshaven.

Refineries served by the line have capacity of 13,500,000 tons per year; this figure should be increased to almost 18,000,000 tons by 1963.

North-West Oil Pipeline is owned by six refining companies, and a seventh which has no interest is taking crude. Holder of the biggest interest is Esso A.G., with 47.2%. Next is British Petroleum, with 26.3%. Purfina Mineraloelraffinerie (Petrofina) has 8.3%; Schloven-Chemie, 7.7%; Union Rheinische Braunkohlen Kraftstoff, 6.8%; and Ruhrchemie, 3.7%. Gewerkschaft Erdoel-Raffinerie takes supplies for its Lingen refinery although it has no ownership in the pipeline.

Rotterdam-Rhine Pipeline. The 183-mile 24-in. Rotterdam-Rhine line, on which construction began in August 1958, has just gone into operation.

Starting at Pernis, the port at Rotterdam, the line extends to Venlo, Holland, branching there with one line going to Wesel and a second to Godorf and Wesseling, Germany. The branch to Wesel connects with a 16-in. line to Gelsenkirchen.

Initial capacity with stations at Pernis and Venlo is 180,000 bbl. per day, to be expanded to 200,000 bbl. daily by 1963 and 400,000 bbl. daily eventually.

Initial throughput rate of 6,500,000 tons per year (130,000 bbl. daily) is expected to be reached by the end of the year. The bulk of crude deliveries will be received by the Royal Dutch-Shell refinery at Godorf, with capacity of 4,000,000 tons per year, to be increased to 7,000,000 tons. Other connected refineries are Caltex at Wesseling and Gelsenberg at Gelsenkirchen.

The pipeline is owned 40% by Dutch-Shell, 20% by Caltex, and 40% by Gensenberg & Mobil Oil (Sales and Distribution) Co.

South European Pipeline. Several international crude lines from the Mediterranean have been proposed, and at least one—perhaps more—will be built.

Preliminary work is being done on the South European Pipeline, a 419-mile 30-in. system from Lavera, near Marseille, to Strasbourg, France, with a 40-mile extension to Karlsruhe, West Germany.

Refining and marketing companies have firmed up plans for construction and use of the $100,000,000 pipeline, which has been endorsed by the French cabinet. It is scheduled to open in 1963.

Initial capacity will be 200,000 bbl. daily, with plans for expansion to 400,000 bbl. daily (20,000,000 tons per year).

Nineteen companies formed an organization to build and operate the crude line, which will enable for the first time the construction of refineries in consuming centers of eastern France and the upper Rhine Valley. Owners include Antar-Petroles, Shell, Caltex, C.F.P., C.F.R., Mobil, British Petroleum, Petrofina, Esso, DEA, Schloven - Chemie, and Wintershall; some will have both French and German affiliates participating.

Two refineries are planned at Strasbourg—one by B.P., C.F.P., and Pechelbronn, the other by various French interests, including Shell, Mobil, and Caltex subsidiaries. Two refineries are planned at Karlsruhe—one by Esso, the other by mixed German interests, including DEA and Mobil. Plants will have 60,000 to 80,000 bbl. daily capacity.

The South European line may be extended into lower Bavaria by laying a 155-mile 22-in. segment with initial capacity of 80,000 bbl. daily. A number of refineries are being considered at Munich and Regensburg, on the Danube. Bavaria has no refinery now.

Italian projects. Besides the possible South European extension in Bavaria, two other groups have their eyes on this market as a pipeline terminus.

ENI, the Italian state oil agency which has big international ambitions, has joined forces with Swiss investors to promote a 250-mile 24-in. pipeline from Genoa to Aigle, Switzerland, where a 40,000-bbl. refinery would be built by Raffineries de Rhone, SA, a Swiss and Italian combine. Various extensions and branches could expand the system to 700 miles with the line going 135 miles past Aigle to the West German frontier, there splitting with a 145-mile branch to Munich, a 94-mile branch to Southwest Germany, and others to Turin, Milan, and Cremona in Italy.

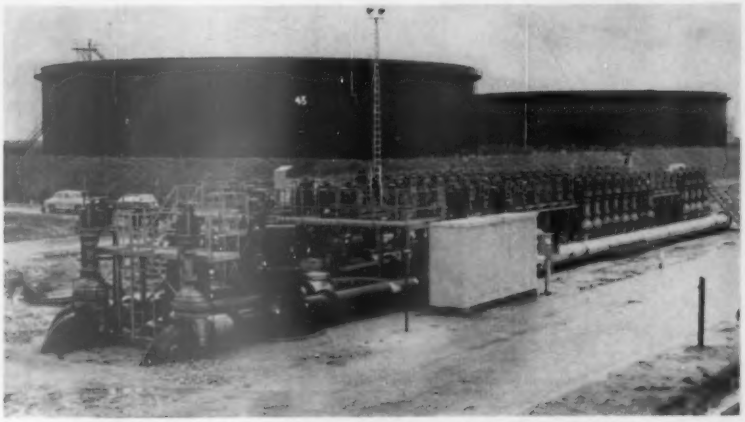
The system would be an outlet for crude production ENI hopes to develop in Egypt and Iran. ENI also has marketing ambitions in Bavaria.

A Saudi Arabian-American group, possibly joined by German banks, is interested in a direct line from Genoa to Munich.

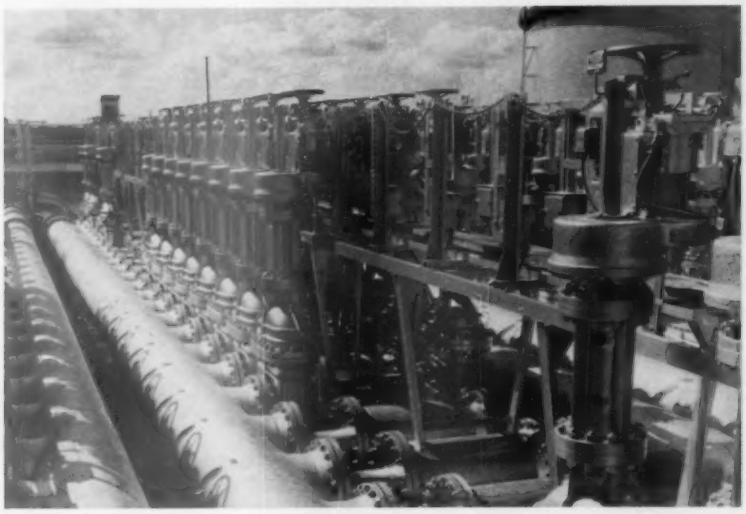
A proposal of Italian interests to build a line from Venice to Munich via Austria has been dropped.

Bavaria has set up a special commission to study the rival proposals.

Russia-Satellite pipeline. A project just getting under way to transport Russian crude from oil fields east of the Volga River to refineries being built in Poland, East Germany, Czech-one of the longest ever undertaken. The Russians have described it as the "largest diameter in the world,"



MANIFOLD AND TANK FARM on NWOP line at Wilhelmshaven.



COMPACT VALVE ARRANGEMENT at origin of NWOP's 28-in. crude line.

while declining to specify the size.

The 2,800-mile system reportedly plans to be moving 300,000 bbl. daily (15,000,000 tons per year) by 1965. Built under the aegis of the Eastern Block Council for Mutual Economic Aid (Comecon), the line is to begin partial operation in 1963. It could open the way for vast expansion in eastern Europe, as well as provide outlets for increased exports of Russian crude to satellite countries. The line might also be the means of increasing exports to noncommercial European nations in competition with with free-world crude.

The terminal countries have combined production of only 26,000 bbl. daily of crude oil and last year imported 140,000 bbl. daily. Being countries of low oil-consumption rates (with oil supplying only 1.4 to 12.6% of fuel needs in the various countries), their expansion based on the new supply is expected to be rapid.

Poland has five refineries aggregating 16,000 bbl. daily, and plans to complete a 40,000-bbl.-daily plant at Plock, northwest of Warsaw, in 1964. An additional 80,000 bbl. daily is planned there by 1967.

East German capacity, now 60,000 bbl. daily, will be increased to 160,000 bbl. daily when a refinery being built at Schwedt is completed.

The Czechs have a refinery under construction at Bratislava, and the remainder of the new supply will go to refineries at Brno, Pardubice, Kolin, and Kralupy.

Hungary is building a refinery near Budapest with initial capacity of 20,000 bbl. daily and ultimate capacity of 60,000 bbl. daily.

Natural-Gas Pipelines

Projects to exploit natural-gas discoveries in France and Algeria have been pushed in the past 3 years. The French have started realizing the benefits of natural gas, liquids, and sulfur production from Lacq field, near the Spanish border, but Algerian development is a problem to stagger the imagination.

Gaz de France. The 1,550-mile gas line tapping Lacq field has been extended to Paris in the past year, completing a project that began in 1957.

This system, the most extensive in western Europe except for Italy's 3,100-mile Po Valley network, will be delivering 471,000,000 cu. ft. daily by 1961.

The new system, although a boon to the economy, is posing problems for competing fuels—fuel oil and coal—as has happened on a much larger scale during the post-World War II gas-pipeline boom in the United States.

Algerian projects. The French have started the first step of a long-range program to unlock the vast reserves of the Sahara Desert field at Hassi R'Mel, whose undefined reaches are estimated to hold 30 trillion cubic feet of gas.

Pipe deliveries have begun for the 327-mile 24-in. pipeline from the field to Algiers and Oran. Contract to lay the first 200 miles has been awarded to Groupement Entrepose-Ste. Parisienne pour l'Industrie Electrique (GREP).

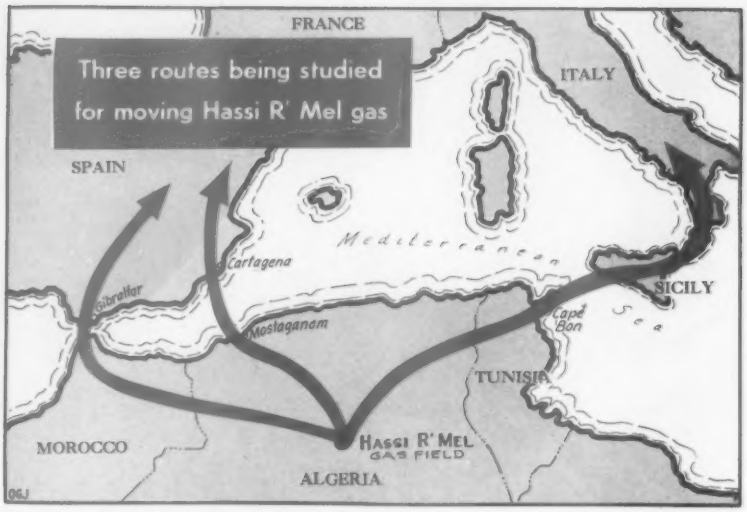
The project is a key in the industrial program planned for Algeria. A booming steel industry is expected to be developed at Bone, based on the cheap and plentiful fuel.

The pipeline should be in operation next year, with initial capacity of 145,000,000 cu. ft. a day. Potential of wells drilled thus far is almost 200,000,000 cu. ft. daily, and productive capacity can be increased as needed.

The French hope ultimately to ship Saharan gas to Europe, either by pipelines across the Mediterranean or as liquefied methane by tanker. Various engineering studies have been made to determine the economy and technical feasibility of the trans-Mediterranean line. There is wide difference of opinion as to the advisability of the pipeline approach. An Italian group will complete one such study this fall, analyzing a proposal for a line from Algeria to Italy and perhaps on to West Germany.

Conch International Methane, Ltd., owned by Continental Oil Co., Royal Dutch-Shell, and Union Stockyards of Chicago, has made a preliminary agreement with the French for a gas-liquefaction plant on the North African coast. The company will have half interest in a venture with SN Repal and CFP, discoverers of Hassi R'Mel, and French banking interests.

HASSI R'MEL gas field has reserves of 1,900 billion cu. m.



UNDERSEA PIPELINE ROUTES offer some promise in getting gas to France.

World's second-biggest gas field seeks a market—and a means of getting to it

EDOUARD REROLLE
Chief Mining Engineer,
President, COMES and General
Director, SEHR

IN NOVEMBER 1956, SN REPAL discovered the natural-gas field of Hassi R'Mel between Laghouat and Ghardaia, Algeria, at a depth of 2,100 m. in the Trias.

The reserves in place have been evaluated at 1,900 billion cubic meters, with the exploitable reserves being in the neighborhood of 800 billion cubic meters. This places Hassi R'Mel field in second place in world production of natural gas, after that of Panhandle field in the United States.

It is estimated that this field may produce for 50 years, with production at 20 billion cubic meters per year. This, in energy equivalents, corresponds to the annual coal production in the Houillier basin of Belgium.

European fields are conveniently found in consumer centers. Algerian use of Hassi R'Mel gas, even with the most optimistic assumption, will be about one billion cubic meters per year at first, and later may reach 4 or 5 billion. Thus, the field will be utilized fully if methane from the Sahara can be disposed of overseas.

To the uncertainties of opening up new avenues of trade are added the hazards of techniques for getting gas to Europe.

Several solutions are considered:

1. **Transporting liquid methane at very low temperature.**

On the one hand, a French group is negotiating with the Anglo-American company, CONCH, which has already experimented with liquefaction in Louisiana, U.S.A., and transportation on the "Methane Pioneer." The aim of these negotiations is to install at Arzew, Algeria, a liquefaction plant which would permit shipment of a billion cubic meters of liquid methane per year to Great Britain.

On the other hand, the French company, Methane Transport, is studying the construction of a ship especially for the transportation of liquid methane. This ship would be used for transportation to France or western Europe.

2. **Transportation by pipeline.**

In this regard, several solutions are considered:

Crossing the Mediterranean through the Strait of Gibraltar. The route, in this case, would be about 3,200 km. in distance to the Ruhr. The depths of the water, about 450 m., and the relatively short crossing pose some technical problems which appear solvable by modern offshore pipelining.

Crossing from Mostaganem, Algeria, to Cartagena, Spain. The crossing of the Mediterranean by this route is technically more difficult. The depths reach 2,700 m. and the distance 200 km., but transport from Hassi R'Mel to the Ruhr would be shortened considerably.

Crossing by Cap Bon in Tunisia, Sicily, and Italy. Technically, this route is still in the stage of very preliminary study. The first impressions are favorable. The technical characteristics appear intermediate between the two preceding solutions.

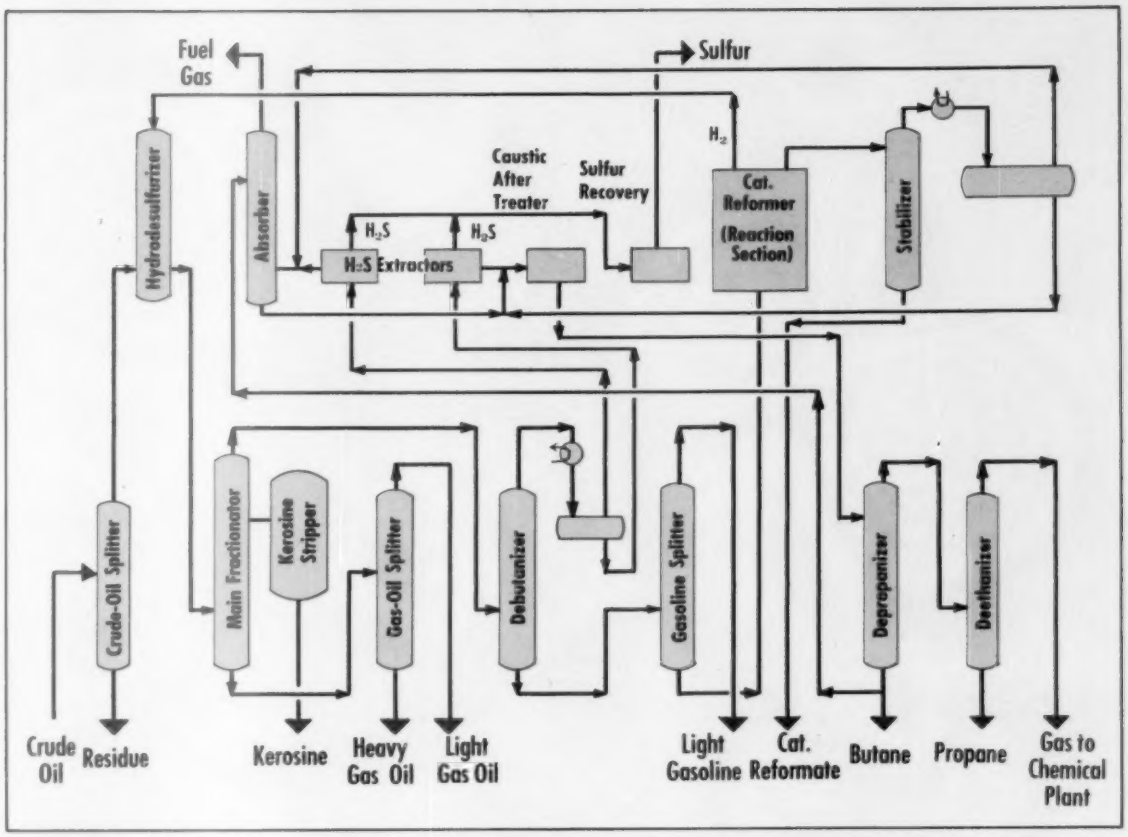
Thus, one finds oneself face to face with three solutions, all three probably workable. The choice will depend in the last analysis in judgment supported by the respective economic values, without excluding the possibility that two solutions might be retained concurrently.

Not only is the gas able to play an essential role in Algeria, but it is capable of bringing about an essential contribution to the European energy balance.

To facilitate carrying out the work of putting to use the gas at Hassi R'Mel, Ste. Nationale de Recherche ed d'Exploitation des Petroles en Algerie (SN REPAL) and Cie. Francaise des Petroles (Algerie)—CFP (A), associated with each other in matters of operating in the Sahara, have decided to create an affiliate: Ste. d'Exploitation des Hydrocarbures d'Hassie er R'Mel (SEHR).

Another affiliate, Ste. Commerciale du Methane Saharien (COMES) is especially in charge of the sale of the gas.

Hassi R'Mel gas has furthermore given rise to the establishment of other sundry companies in which SN REPAL and CFP (A) have an important interest.



PROCESSING SCHEME eliminates all waste water which would result from treating processes, and which would normally place a heavy load on the waste-water purification plant.

How Shell cut pollution in Rhineland

• A new processng scheme devised for Deutsche Shell's Godorf refinery has cut air and water pollution to an irreducible minimum in one of the most densely populated regions of the world.

THE BASIC QUESTION by which plant designers today are guided is: How do I economically manufacture my products with a minimum of waste and the least possible nuisance for my neighbors?

Deutsche Shell AG, the Shell organization in Germany, provided a good answer to this question in the design of its new refinery at Godorf, Rhineland.

As the sketch shows, the Godorf refinery lies on the left bank of the Rhine between Bonn and Cologne, just at the start of the large loop in the river upstream of Cologne.

Three factors determined the choice of this location: (1) the demand for oil products in the area, (2) position on the Rhine with its transport facilities, and (3) the nearness of Rheinische Olefinwerke. This firm, jointly owned by Deutsche Shell and Badische Anilin & Soda Fabrik AG, makes polyethylene and epoxy resins from petroleum products. Pipelines link the Godorf refinery and Rheinische Olefinwerke.

Refinery products include liquefied petroleum gas, premium and regular motor gasoline, jet fuel, gas oils, and fuel oils. Benzene and light gases are sent to Rheinische Olefinwerke for further processing into chemicals.

Refinery capacity is 4 million tons annually. Process flow is shown in the diagram.

Water-Pollution Abatement

All efforts to cut water pollution at a refinery ultimately reduce to four fundamental approaches:

... **Use and discharge** as little water as possible.

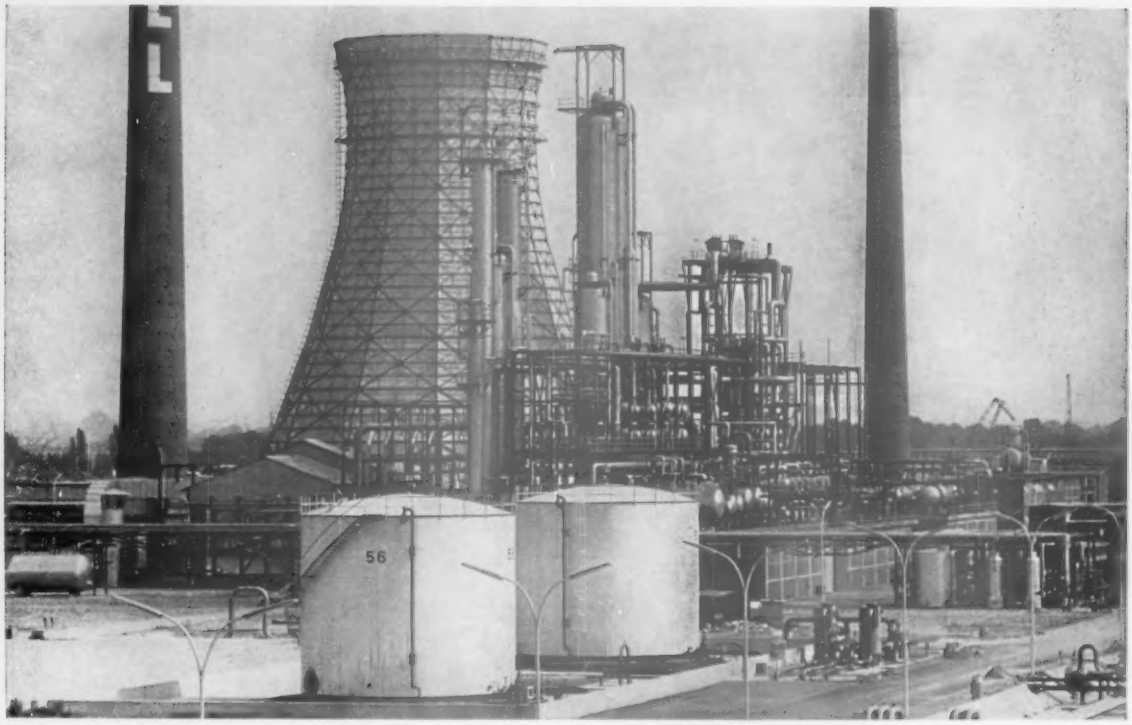
... **Keep pure** and contaminated water separate as far as possible.

... **Discharge** all effluent water in the purest possible form.

... **Prevent** oil from seeping into the ground and contaminating ground water.

Process water at the Godorf refinery is drawn from three deep wells. A cooling-water circuit considerably reduces the refinery's water consumption; and it also insures that, if a cooler becomes defective, water contaminated with oil cannot enter the Rhine undetected. The only water losses are caused by evaporation and cooling-tower blowdown.

Rain water. To minimize contamination, a separate sewer system collects all refinery drainage and discharges it to a basin which is built on the principle of an oil-water separator. The 1,235-cu.-ft. basin is large enough to insure a sufficient residence



STACKS ARE built 325 ft. high to allow flue gases to diffuse into the atmosphere rapidly.

time, even after a torrential downpour. No drainage from the refinery can enter the Rhnie without first passing through this separator.

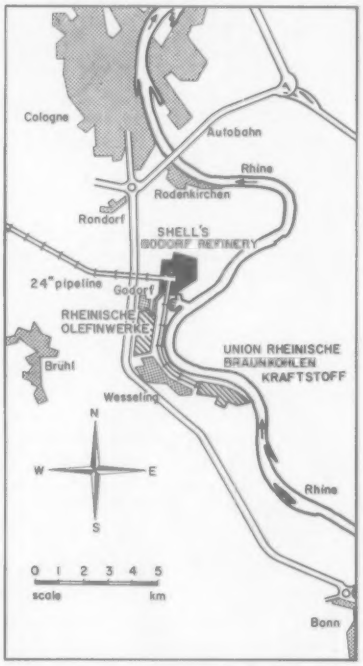
Process water. German specifications for waste water do not allow a residual oil content of more than 10 p.p.m. Process water usually contains oil in such a fine dispersion that normal gravity separation is not enough to yield the required content. To meet the 10-p.p.m. specification, biological or chemical flocculation processes are required.

The costs of installing such processes are high, and they are expensive to operate. Since much of the polluted water comes from treating processes, a processing scheme which eliminates the need for chemical treating would provide several economic advantages. Such a scheme was devised for Godorf.

Crude leaves the crude-oil splitter as fuel oil and total distillate. This distillate, which contains all the components of the crude boiling below about 350° C. is then hydrodesulfurized by the Shell Trickle process. Hydrogen is supplied by the Platformer. Desulfurized distillate is then separated by the main fractionator into gasoline, kerosine, and gas oil.

The gas oil and aviation kerosine require no aftertreatment, but leave the fractionator as marketable products. The gasoline fraction is passed through a debutanizer and is then separated in the gasoline splitter into light and heavy gasoline.

Part of the light gasoline goes for



THE ROTTERDAM - RHINE PIPELINE supplies crude to the Godorf refinery. Finished products move out along the Rhine.

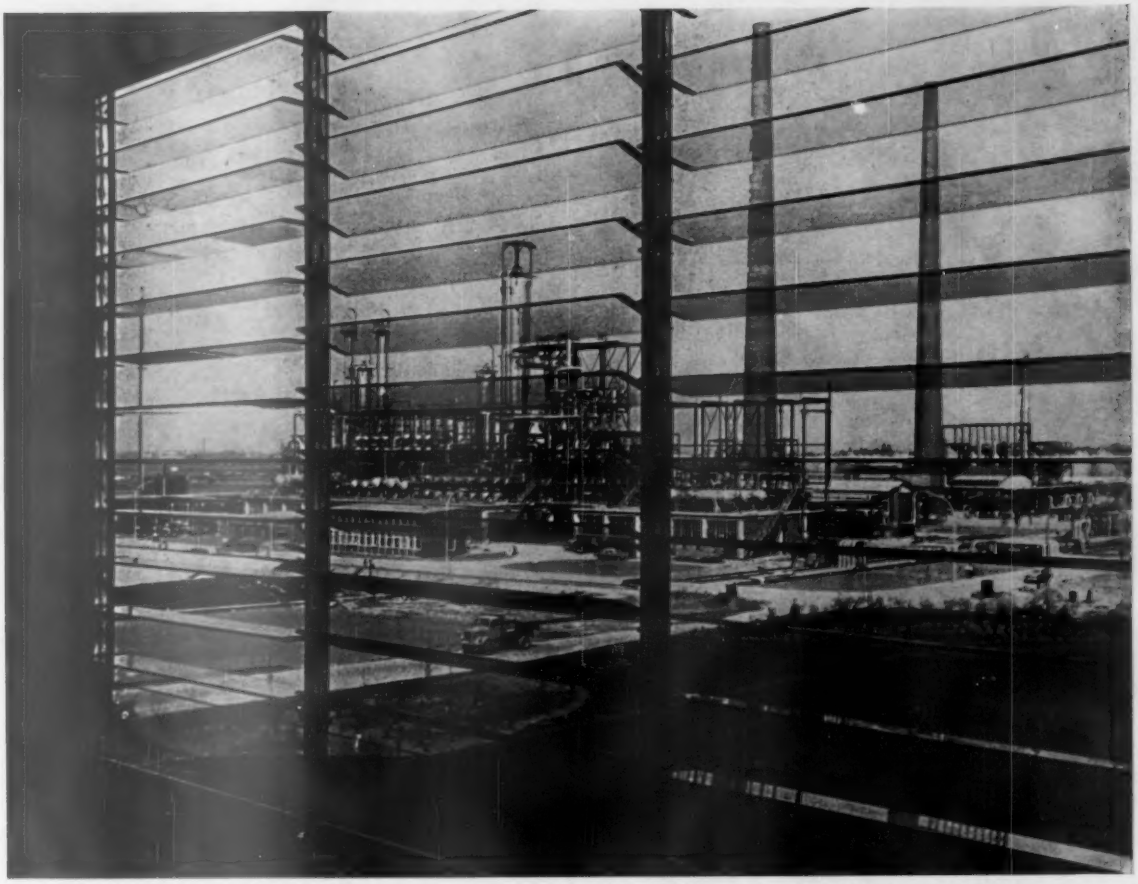
further processing to Rheinische Olefinwerke; the rest is used in the refinery as blending stock for motor fuel.

Heavy gasoline is upgraded to the necessary octane in the Platformer. The top product of the debutanizer, after the removal of butane and propane, is also used as a base stock by Rheinische Olefinwerke.

The H_2S obtained from extraction of the gas and liquid phases is, as usual, processed into sulfur in a sulfur-recovery unit. The only nonregenerative chemical treatment in this processing scheme is the caustic-soda extraction unit. This aftertreatment removes the last traces of H_2S. Spent caustic soda is introduced into the crude stream to control pH.

By hydrogenating all of the light products, including gas oil, practically all of the sulfur in this wide fraction is removed as hydrogen sulfide. As a result, not only are the most important undesirable constituents removed from the finished products, but also those substances which in conventional processing are chiefly responsible for air and water pollution. Furthermore, unstable compounds are rendered harmless by hydrogenation, so that the individual products require no further treatment by the usual processes of sweetening, acid, or caustic-soda treatment.

This, in turn, eliminates all of the contaminated waste water which would result from such processes, and



MODERN PLANT LAYOUT at Godorf refinery, showing crude distillation, hydrodesulfurizer, and Platformer.

which would normally place a heavy load on the waste-water purification plant.

Primary distillation is the only step in which process water is contaminated; it originates from water in the crude oil and from steam injection in the column. All of the other distillation processes are performed without steam injection.

Water from primary distillation is combined with ground drainage from the various plants and sent to the water-purification facilities. Thanks to the new processing technique, used for the first time in Shell's Godorf refinery, not more than 40 g.p.m. of oily waste water requires purification.

Water purification. The plant consists of a settling tank, followed by an oil-removal section using flocculation with iron hydroxide. In the first basin of this section particles of oil entrained with the waste water are removed by absorption on iron hydroxide. The sludge which settles in the first stage is thickened by light stirring in a second basin and then filtered in a chamber press. The filter residue is burned.

A similar installation is used for the chemical flocculation of the boiler feed and cooling-water makeup. The iron hydroxide sludge obtained here can be reused in the waste-water purification plant, which means a considerable saving on chemicals.

Ground water. To prevent oil seepages into the ground, the following measures are taken:

1. All pipelines are laid in concrete trenches which are provided with suitable drainage to the oily water system.
2. All tank pits are covered with a layer of concrete to make them impermeable to oil. These pits are also provided with suitable drainage to the oily water system.
3. Several of the water wells are located in such a way that a permanent check on oil contamination of the ground water can be maintained.

Waste water leaving the refinery has an oil content of less than 10 p.p.m., and also has a salt content which is much less than that of a refinery using a conventional processing scheme.

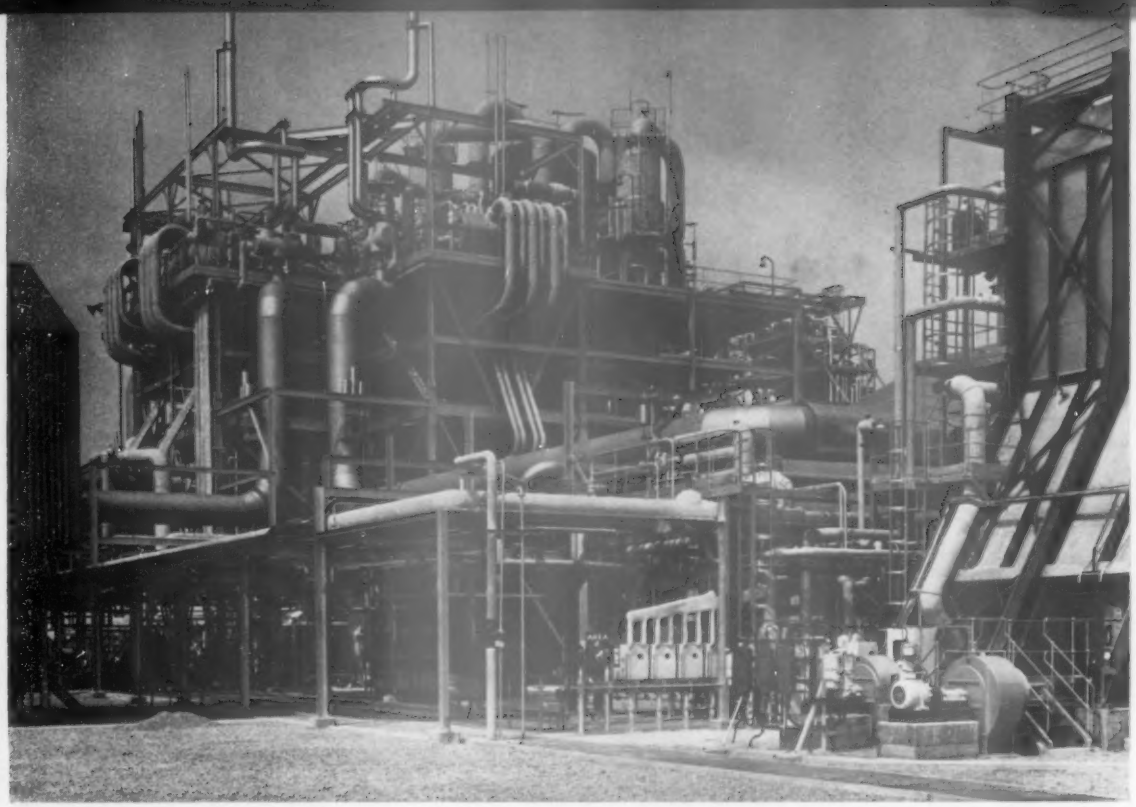
Air-Pollution Abatement

A striking feature of Godorf processing is that only marketable products, from fuel oil to desulfurized fuel gas, leave the plant. There is no intermediate storage, and consequently no odors from tanks, leakage, or pumping of intermediate products. Furthermore, crude oil and low-boiling products are stored in floating-roof tanks, so that air pollution caused by light hydrocarbons is prevented.

Another major advantage of this method of operation is that a fuel gas free from sulfur is obtained. Since this fuel gas is used exclusively in the refinery, considerably less sulfur dioxide enters the atmosphere from flue gases than would be the case if only fuel oil were burned.

In addition, almost all of Godorf's power supply comes from outside sources, which further reduces the amount of SO_2 which comes from the refinery.

Finally, ground-level concentration of stack gases has been reduced by building the stacks to a height of 325 ft. At this height, the flue gases diffuse into the atmosphere rapidly. In any case, the combined oil-gas firing of the furnaces does not produce smoke.



OLEFIN UNIT at ICI's Wilton plant in England is indicative of the tremendous petrochemical growth taking place in Europe.

European petrochemical output rises nearly 500% in 1953-1959 period

. . . exceeding both industrial and all-chemical production rate of gain

BY W. P. GEE, H. A. KIRSCH AND C. M. W. ORPEN
Texaco Inc.

THE PERIOD in Europe's* history between the beginning of World War I and the end of World War II may well be defined as an economic dark age. As illustrated in Fig. 1, relatively little over-all growth in total industrial output occurred and the standard of living in this area was essentially at a standstill. Following World War II, however, a spectacular reawakening of Europe's industrial capabilities has occurred.

This upsurge in industrial activity has resulted in expansion of demands for raw materials of all varieties and, in particular, for chemicals. Analyses carried out by the Organization of European Economic Cooperation (OEEC) have indicated the magnitude of the growth rate in the European chemical industry for the period 1948 through 1959. This is shown graphically in Fig. 2 from which it may be seen that chemical production has grown at an even more rapid pace than total industrial production. In particular, chemical production in 1959 exceeded the 1948 level by 194% as compared to the 108% increase in total industrial production during the same period.

What has happened in the petrochemicals segment of Europe's chemical industry, where is it now, and what is its future? Available information on the growth of petrochemical production in Europe is shown in Fig. 3. In terms of carbon content, production has grown from approximately 208,000 metric tons in 1953 to about 813,000 metric tons in 1958 and, according to OEEC estimates, to about 1,225,000 metric tons in 1959.

Thus, the 1953 production level was exceeded by 294% in 1958 and by an estimated 489% in 1959. When compared with the growth rates in total chemicals and total industrial production, Fig. 4 shows that the rate of petrochemical growth has greatly exceeded the growth rate in these other two areas.

Europe vs. U. S. In view of this very rapid growth rate, one might well be concerned about where this industry

*The countries considered include Austria, Belgium, Denmark, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, and the United Kingdom.

Fig. 1

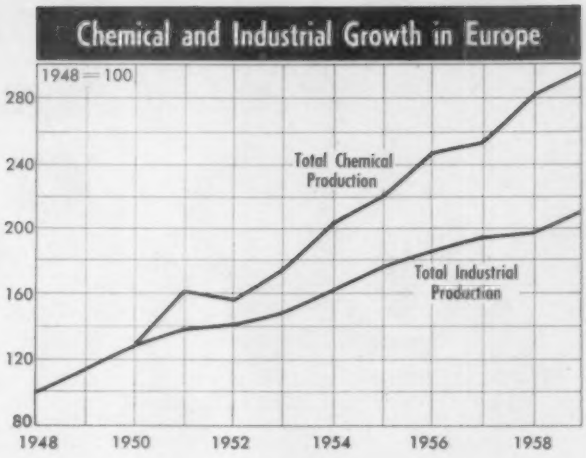


Fig. 2

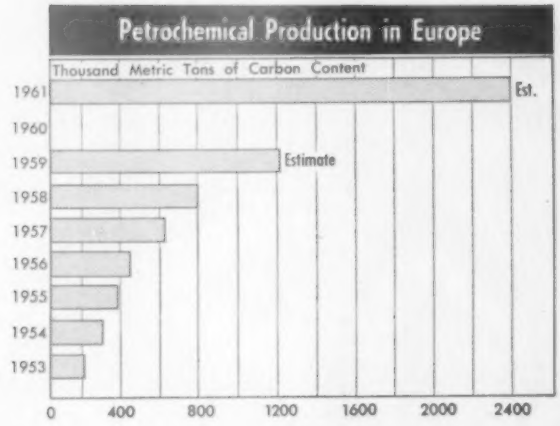


Fig. 3

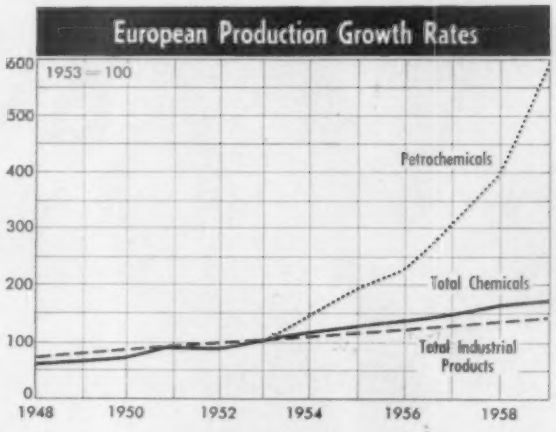


Fig. 4

is headed. What are the limits for the growth in Europe's petrochemical industry? One method of arriving at an indication of this petrochemical horizon is to compare the status of the industry in Europe and the United States. Due to differences in the categories normally included in the statistics for petrochemicals in the United States and Europe, a precise comparison of the magnitude of petrochemical production and growth rates in these two geographic areas is difficult.

However, by summarizing U. S. production figures for these categories included in the OEEC's definition of petrochemicals it is possible to arrive at data which are reasonably comparable to those available for the European industry. Information revealed by such a comparison is shown in Fig. 5.

It may be seen that the growth rate in total U. S. petrochemical production has generally exceeded that for the European industry. In 1958 and 1959, total production in the United States was about five and four times European petrochemical production, respectively. On a per capita basis, U. S. production in those two respective years was about nine and seven times European per capita production.

In other words, on the basis of total production, the European petrochemical industry has now reached the 1947-1948 level of this industry in the United States. On a per capita basis, the European industry has not reached the 1945 level of the U. S.

If the level of total U. S. petrochemical production is used as a criterion, Europe's petrochemical horizon leaves considerable opportunity for further growth. But, on the basis of per capita production, which may be a better criterion, the potentialities for growth are even more outstanding. The 1959 U. S. population was about 177 millions while that of the Euro-

TABLE 1—INVESTMENTS IN EUROPEAN PETROCHEMICAL FACILITIES
(Millions of U. S. dollars)

	Dec. 31, 1958	End of 1961	Per cent expansion
France	84	309	268
West Germany	263	513	95
Italy	123	318	158
United Kingdom	265	409	54
Other countries including Austria, Belgium, Greece, Denmark, Netherlands, and Spain	40	66	65
Total	775	1,615	108

Source: OEEC.[4]

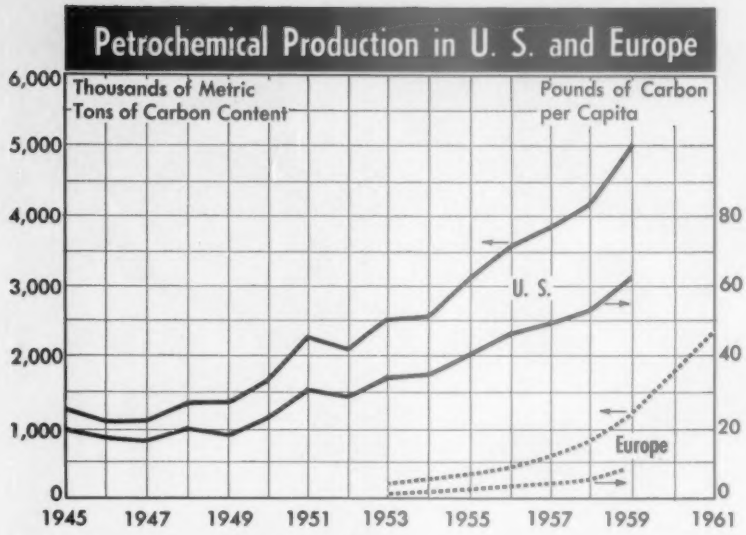
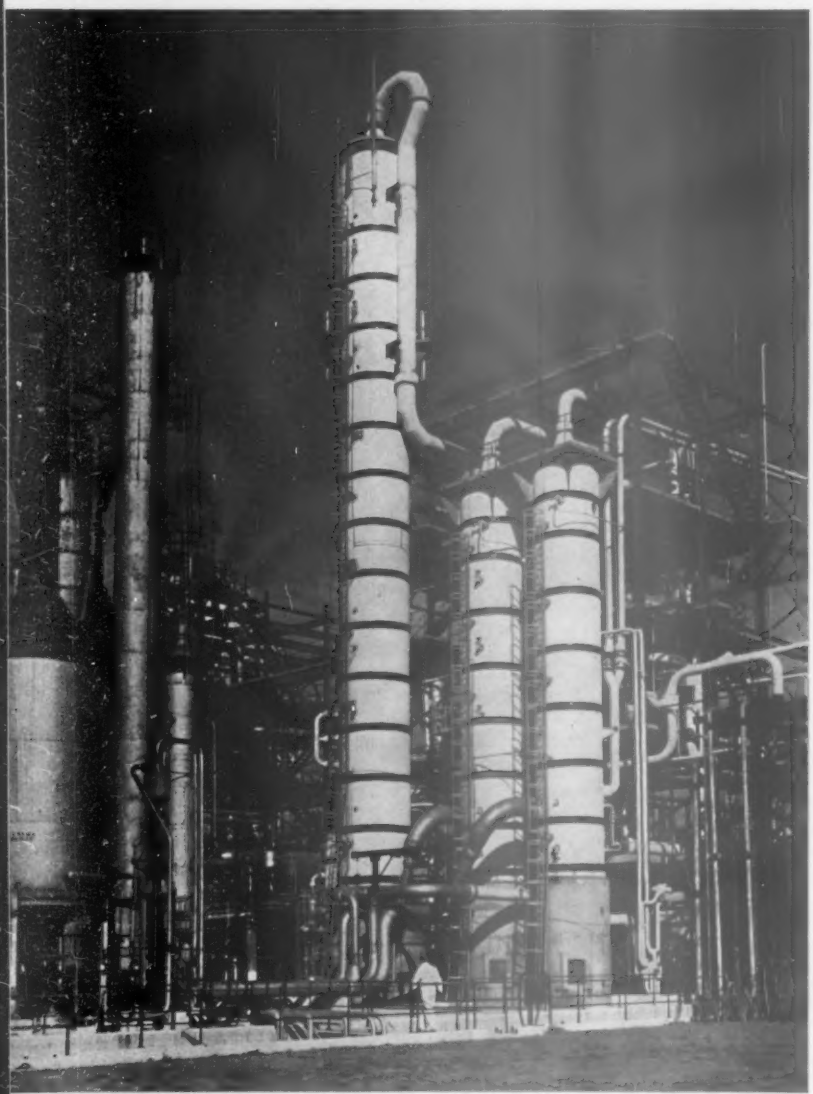


Fig. 5



ICI's BILLINGHAM WORKS has three of the largest units in the world for producing higher alcohols from olefins by the oxo process.

pean countries considered here was estimated at approximately 295 millions in 1959, about 1.6 times the U. S. total. Thus Europe, with its improving standard of living, represents a petrochemical market which has the potential of becoming considerably greater than that of the United States.

Present growth. Some of the opportunity for growth in Europe's petrochemical industry is already being realized. Table 1 shows a breakdown by country of total investment in the European industry at the end of 1958 and, as estimated by the OEEC, for 1961.

The additional more than $840,000,000 investment anticipated for 1961 represents an increase of at least 108% over 1958 and will raise 1961 production capacity to a level of at least 2.4 million tons in terms of carbon content, about three times the industry's output in 1958. This, as shown in Figs. 3 and 5, would bring the total production level up to about that of the U. S. industry in 1953. Thus, considerable further opportunity for growth appears possible.

Future trends. Much of the future expansion in European petrochemicals will occur in chemical areas which have very large per capita consumption possibilities such as styrene-butadiene synthetic rubber, polyethylene and polypropylene plastics, ethylene oxide, synthetic fibers, and carbon black. Some of the future petrochemical expansion will also result from the substitution of petroleum for coal as a source of aromatics such as benzene, toluene, and xylenes. Probably, as is now the case in the United States, petroleum will exceed coal as a source of these aromatics.

Supplying the basic raw materials required to support Europe's growing petrochemical industry will present no major roadblocks. The huge crude-oil supplies of the Middle East supplemented by the oil and gas fields of the Sahara, Italy, and France will be the big sources of hydrocarbons and should be sufficient to meet requirements for many years into the future.

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European petrochemical capacity is zooming

EUROPE is leaning more and more on oil and natural gas as a source of raw material in a gigantic push to increase its chemical-manufacturing capacity.

Dozens of important new petrochemical plants have recently been announced or are now under construction in Europe. Leading the race are such established chemical-manufacturing countries as the United Kingdom, Germany, France, and Italy.

Other countries, such as Greece and Denmark, are turning to petrochemical manufacturing on a larger scale for the first time.

Here is a summary of some of the more important construction projects under way or recently announced in European countries outside the Soviet orbit:

BELGIUM

AMOCO FINA, S.A., owned jointly by Amoco Chemicals Corp., and Petrofina, plans to manufacture additives for petroleum products at a plant to be completed at Antwerp early in 1961.

COBENAM, S.A., subsidiary of Union Carbide Corp. and Ste. Chimique des Derives du Petrole, S.A., will have capacity of 30,000,000 lb. per year at a polyethylene plant at Antwerp. with completion scheduled late 1961.

STE. INDUSTRIELLE DE LA CELLULOSE (SICAC) and **MONSANTO CHEMICAL CO.** have formed a joint subsidiary to build a plant for polyvinyl butyral sheets at Ghent. Completion is set for 1961.

UNION CHIMIQUE BELGE. S.A., will complete a 5,000-metric-ton per year phthalic anhydride plant at Ghent early in 1961, at cost of $2 million.

DENMARK

IMPERIAL CHEMICAL INDUSTRIES, LTD., and two Danish companies, Dampskibsselskabet Svenborg and Dampskibsselskabet af 1912, will build a polyolefins plant at Maersk near Copenhagen. Plans call for capacity of 15,000 tons per year. Site is near existing facilities at the Maersk refinery.

FRANCE

AZOLAC will begin production early in 1961 at new facilities to make nitrogen fertilizers and urea from ammonia at Lacq in southwestern France.

CIE. FRANCAISE DE RAFFINAGE and **EL PASO FRANCE-AFRIQUE, S.A.** (the latter owned 85% by El Paso Natural Gas Products Co.) will build a 44,000,000-lb. per year high-pressure polyethylene plant in the Le Havre area adjacent to Cie. Francaise's refinery at Gonfreville. Construction will start early 1961, with completion early 1963. It will cost $17 million.

CIE. FRANCAISE DU CARBON BLACK, S.A. (Continental Carbon Co. and Phillips Petroleum Co.) was scheduled to complete a new carbon-black plant at Bec d'Ambes (Bordeaux) in late 1960, with capacity of 25,000 metric tons per year.

ESSO STANDARD, S.A., plans an aromatics plant with capacity of 45,000 metric tons per year at its Port Jerome refinery. Completion is scheduled first half of 1962.

ETHYLENE PLASTIQUE NORMANDIE will build a 15,000-ton per year polyethylene plant in the Lacq area of southwestern France.

FIRESTONE TIRE & RUBBER CO. is building facilities at Port Jerome for production of 20,000 tons per year of butadiene polymers, butadiene-styrene copolymers, and other synthetic latices, with completion expected late 1961 or early 1962.

NAPHTHACHIMIE will build a polybutene unit at Lavera using the Cosden Petroleum Corp. process. Butachiene facilities are now under construction, with completion in 1961.

ORONITE CHEMICAL CO. and **STE. CALIFORNIE-ATLANTIQUE** (Antar Petroles de l'Atlantique and Ste. Progil) are building new facilities at Donges to make 8,500 tons per year of paraxylene from feed stocks from the Antar refinery, with completion scheduled late 1960.

PLASTICHIMIE, S.A. (Pechiney and Dow Chemical International) plans to complete a plant to produce polystyrene and vinylidene chloride copolymer at Ribecourt near Paris in mid-1961.

STE. ANONYME REICHHOLD BECKACITE (affiliate of Reichhold Chemicals, Inc.) will build a 10,500,000-lb. per year maleic anhydride plant at Niort, Deux-Sevres. Scientific Design Co., New York, has design contract.

STE. DES ELASTOMERS DE SYNTHESE (owned by Shell-St. Gobain, Texas Butadiene & Chemical Corp., and several tire-manufacturing companies) is scheduled to complete a new 50,000-ton per year SBR plant at Berre in southern France in 1961.

STE. INDUSTRIELLE DES DERIVES DE L'ACETYLENE (SIDA) was scheduled to go on stream in 1960 at Notre-Dame de Gravenchon with a new plant to manufacture butanol.

STE. NATIONALE DES PETROLES D'AQUITAINE is building facilities for acetylene, methanol, and ammonia at Lacq. Another 1,000-ton per day sulfur unit will also be built soon, giving the plant total capacity of 4,000 tons.

STE. NORMANDE DE MATIERES PLASTIQUES will have capacity of 20,000,000 lb. per year of polyethylene at Lacq. The company also has an agreement with Montecatini to produce polypropylene.

STE. RHODIACETA (subsidiary of Rhone-Poulenc) will build one of the largest hydrogen plants in Europe at Lyon. Construction will be by Chemical Construction, Ltd. Capacity will be 2,500 M.c.f.d. of hydrogen gas from reformed natural gas from Lacq field.

STE. VINYLACQ (owned by Pechiney, St. Gobain, and Banque de Paris et des Pays-Bas) will build a plant for manufacture of vinyl chloride at Lacq.

UGILOR has an agreement for use of Distillers Co.'s patents for making acrylonitrile from propylene and ammonia at a plant to be built by UGILOR.

UNITED CARBON CO., INC., will complete a new carbon-black plant near Rouen early in 1961. The $5,000,000 plant will have initial rated capacity of 50,000,000 lb. per year.

GERMANY (WEST)

BUNA WERKE HULS, GMBH, is expanding capacity of its Marl plant from 70,000 to 120,000 tons per year. Present production at the plant includes butadiene, styrene, copolymer, and synthetic rubber.

CALIFORNIA CHEMICAL and **BP** plan to build new facilities to produce paraxylene, orthoxylene, and ethylbenzene at Dinslaken.

CARBOSUF CHEMISCHE WERKE, GMBH (joint subsidiary of Glanzstoff Courtaulds, GMBH, and Dr. Jacob, Chemische Fabrik) is building a carbon disulfide plant at Cologne-Weidenpesch with capacity of 50,000 tons per year, using raw materials from refineries in that area. Completion expected by the beginning of 1962.

DEUTSCHE ERDOL-AKTIENGESELLSCHAFT is building new facilities at Heide, Holstein, to produce 11,000,000 lb. per year of isobutylene, with production to start in 1961.

ERDOLCHEMIE, GMBH (Farbenfabriken Bayer and British Petroleum) is adding capacity at Dormagen near Cologne for production of 30,000 tons per year of butadiene, 45,000 tons per year of diisobutylene and triisobutylene.

FARBWERKE HOECHST, A.G., has a new expansion program at Hoechst which includes doubling capacity of its polypropylene plant to 16,000 tons per year, and expansion of ethylene capacity.

REICHHOLD CHEMIE (joint venture by Reichhold and Deutsche Erdol) is expected to begin production in 1961 at new facilities for making petrochemical raw materials at the North Sea port of Brunsbuettelkoog.

RHEINISCHE OLEFINWERKE, GMBH (owned by Shell and Badische Anilin & Soda-Fabriken) is expanding ethylene capacity at Wesseling near Cologne from the existing 102,000,000 lb. per year to

255,000,000 lb. per year by 1962, and polyethylene capacity correspondingly.

RHEINPREUSSEN, A.G., will build a 13,200,000-lb. per year maleic anhydrite plant at Meerbeck, using the Scientific Design Co., Inc., process of fixed-bed, catalytic air oxidation of benzene.

GREECE

DOW CHEMICAL CO. is building a polystyrene plant in Greece, with raw materials to be imported. It will be the first such plant in this country. Completion is scheduled the end of 1961.

ITALY

ANIC plans a petrochemical plant at Gela, Sicily, based on local crude production.

COLUMBIAN CONTINENTAL EUROPA is building a 60,000,000 lb. per year carbon-black plant at Trecate. Cost will be about $6,000,000.

DISTILLERIE ITALIENNE will have capacity of 11,000 tons per year at a butanol plant at Milan.

DOW CHIMICA ITALIANA. S.P.A., is building a new plant for production of polystyrene compounds near Leghorn, with completion scheduled late in 1961.

ENI plans a $64,000,000 petrochemical plant at Ferrandina, based on natural gas. This project is still in the planning stage.

At Gela, Sicily, ENI plans to build a refinery and petrochemical facilities based on Gela crude. The engineering is now under way.

MONTECATINI is building a $95,000,000 petrochemical complex at Brindisi, one of Europe's largest. Production will include ethylene-propylene and ethylene-butylene copolymers, polyethylene, isotactic polypropylene, polymers for synthetic fibers, aldehydes, alcohols, and organic solvents. Completion is scheduled in 1962. The company has a polybutene-1 pilot plant at Brindisi and is planning commercial facilities.

At Terni, Montecatini will expand polypropylene staple fiber capacity by 1962.

PHILLIPS CARBON BLACK ITALIANA, S.P.A. (owned by Phillips Petroleum Co. and ANIC) will have capacity of 25,000,000 lb. per year of carbon black at a plant at Ravenna. Completion is expected by January 1, 1962.

SHELL ITALIANA is adding facilities at Rho near Milan for fractionation and extraction of 100,000 tons per year of aromatic solvents, with completion set for mid-1961.

S.P.A. CELENE (owned jointly by Union Carbide and Soc. Edison) will have capacity of 12,500 tons per year of propylene oxide at a plant near Priolo, Sicily. Also, polyethylene plant capacity is being expanded to 32,500 tons per year.

NETHERLANDS

AKU and **BRITISH INDUSTRIAL PLASTICS** are reportedly forming a jointly owned company to build a plant for making urea and melamine formaldehyde, and resins.

B. F. GOODRICH CHEMICAL CO. and **ALGEMENE** are expanding synthetic-rubber facilities at Arnhem, with completion due early 1961.

DU PONT DE NEMOURS (NEDERLAND), N.V., is building a new plant at Dordrecht with capacity of 15,000,000 lb. per year of acrylic fiber. Completion is expected late 1961.

FOSTER GRANT CO. plans facilities for resin polymerization near Rotterdam, and possibly the manufacture of raw materials.

KONINKLIJKE ZWAVELZUURFABRIEKEN was scheduled to complete a synthetic phenol plant at Amsterdam by the end of 1960.

NEDERLANDSCHE DOW MAATSCHAPPIJ, N.V. (wholly owned subsidiary of Dow Chemical International) will complete a $2,000,000 styrene-butadiene latex plant at Rotterdam early in 1961.

N.V. ROTTERDAMSE POLYOLEFINEN MAATSCHAPPIJ (new company formed by Royal Dutch-Shell Group and Montecatini) will build a polypropylene plant at Rotterdam, using materials from the nearby Shell refinery.

ROYAL DUTCH-SHELL GROUP plans to have facilities to produce polyisoprene and polybutadiene, which would be the first commercial availability of these products in Europe.

STAATSMIJNEN (State Mines) will expand ethylene cracking facilities from 15,000 to 23,000 tons per year. Capacity of Staatsmijnen's high-pressure polyethylene facilities is expected to reach 25,000 tons per year in 1960. Also, a 10,000-ton per year low-pressure polyethylene plant will be built.

STAATSMIJNEN in LIMBURG will produce phthalic anhydride at a plant at Geleen. Scientific Design Co., Inc., has the contract. Completion is scheduled early in 1961.

STAATSMIJNEN in LIMBURG and **DOW CHIMIE, A.G.,** will build a new phenol plant at Rotterdam. Capitalization is estimated at $10,600,000. Part of the production will supply requirements of Staatsmijnen in Limburg.

PORTUGAL

MONTECATINI and **UNIAO FABRIL DO AZOTO** will build a new urea plant at Labradio near Barreiro with capacity of 40,000 metric tons per year. M. W. Kellogg Co. has the contract.

SHINETSU CHEMICAL and **MITSUI TRADING CO.,** in a joint venture with four Portguese companies plan to build a polyvinyl chloride plant with initial capacity of 300 to 500 tons per month.

SOC. PORTUGUESA DE PETROQUIMICA SARL will have capacity of 185 tons per day of ammonia at Lisbon, plus facilities to produce pure hydrogen, nitrogen, oxygen, and carbon dioxide.

SPAIN

INI (government agency) plans to build a petrochemical plant at the Puertollano refinery in South Central Spain.

UNION QUIMICA DEL NORTE DE ESPANA, S.A. (UNIQUINESA) and **DOW CHEMICAL** plan to build a plant for production of propylene, ethylene, and butadiene, and other materials based on these products. The project has the approval of the Spanish Government.

UNITED KINGDOM

BRITISH GEON CO. (owned by Distillers Co., Ltd., and B. F. Goodrich Chemical) is building a $5,600,000 polyvinyl chloride plant at Barry, South Wales, which will increase capacity of existing facilities. Completion is expected late 1961.

BRITISH HYDROCARBON CHEMICALS, LTD. (owned by British Petroleum, Ltd., and Distillers Co., Ltd.) has started construction of facilities at Grangemouth, Scotland, costing about $14,000,000. Production will be butadiene, methanol, and ethylene dichloride, using raw material from BP's refinery.

Near the BP refinery at Llandarcy, South Wales, the company plans a new petrochemical plant involving initial investment of about $28 million.

BP CALIFORNIA (British Petroleum and California Chemical Co.) will build a new aromatics plant adjacent to BP's refiner at the Isle of Grain, Kent, England. Construction is to start immediately.

ESSO PETROLEUM CO., LTD., is adding new steam-cracking ethylene recovery and butadiene extraction units at Fawley, Hants., England. Esso is also building a 30,000-ton per year butyl plant, with completion in about 3 years.

FORTH CHEMICALS, LTD., (British Hydrocarbon Chemicals, Ltd.. and Monsanto Chemical Co., Ltd.) will increase capacity at Grangemouth, Scotland, to 50,000 tons per year by 1961. Present production includes styrene polymer, ethyl and di-ethylbenzene, polyethylbenzenes, and toluene.

IMPERIAL CHEMICAL INDUSTRIES, LTD., will increase methanol capacity at Heysham, England, from 30,000 to 75,000 tons per year, with completion in 1962.

At Severnside Site, England, long-term plans call for a large complex near Avonmouth, with production based on petroleum gases. Facilities now under way include units for 35,000 tons per year of ethylene oxide, ethylene glycol, and related chemicals. Scheduled on stream late 1963 is a 100,000-ton per year ammonia plant.

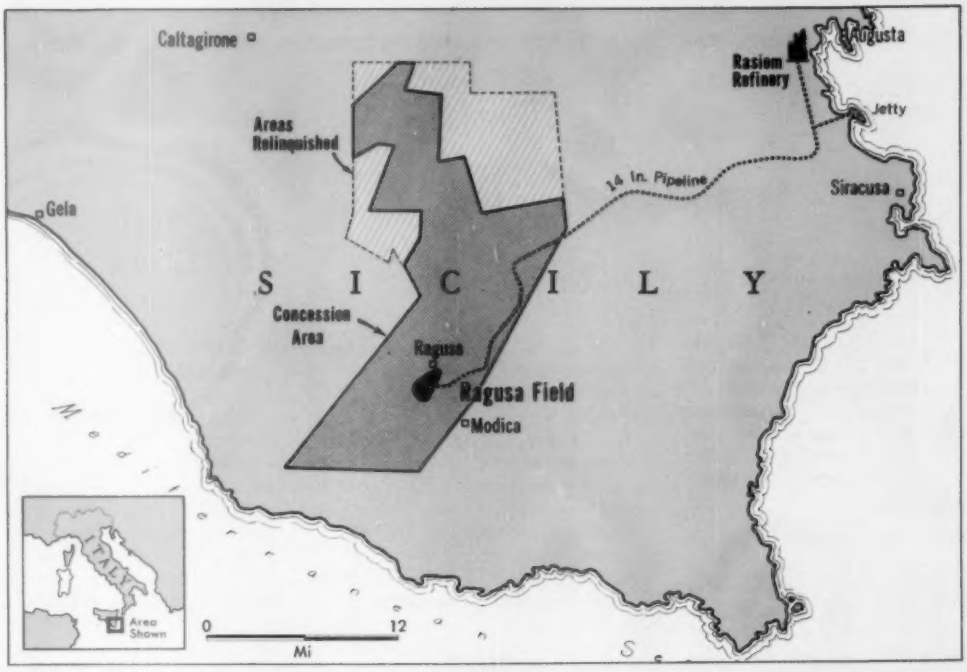
At Wilton, England, Imperial's new projects include a 30,000,000-lb. per year expansion of the terephthalic acid plant, with completion in 1960.

MONSANTO CHEMICAL CO., LTD., is going on stream with a new 15,000,000 lb. per year maleic-anhydride plant at Newport, Wales. Another plant now being built will have capacity of 5,000 tons per year of styrene-butadiene resins and latices.

SHELL CHEMICAL CO., LTD., will increase production of ethylene oxide from 25,000 to 45,000 tons per year when new facilities now under construction at the Carrington Works are completed. Facilities to produce 30,000 tons per year of polyethylenes and polypropylene are set for completion in 1961. In about 3 years, facilities to produce polyisoprene and polybutadiene synthetic rubbers will be completed.

YUGOSLAVIA

FABRIKA AZOTNIH DUBRIVA is building petrochemical facilities at Pancevo near Belgrade. Basic raw material will be natural gas.



SUCCESS RATIO for Ragusa field has been very high; 46 of 50 wells have been producers since 1 Ragusa was put on production in 1954.

Asphalt deposits have been known for centuries, and oil possibilities suspected since 1924, but . . .

First commercial production in Sicily came in 1954

DEVELOPMENT WELL 46 for Ragusa field. Total field production to June, 1960, was nearly 30 million barrels.

THE SICILIAN OIL LAW, passed in 1950, is largely responsible for Gulf Oil Corp's interest in Sicily's oil production. The law contained favorable provisions for foreign companies, so Gulf obtained an exploration permit.

A successful wildcat, the 1 Ragusa, was completed in January 1954 to open up the island's production. It was completed at a depth of 6,971 ft. in Triassic dolomites.

Early indications. The presence of hydrocarbons in the area was no secret because many buildings used bituminous limestone as a construction material. Extraction of the oil from this limestone was accomplished by various companies through a heating or retorting process.

In 1922-23, an American geologist, J. Elmer Thomas, felt that conditions were favorable for the occurrence of liquid petroleum, and he was able to interest Gulf in his ideas. But it wasn't until the favorable provisions of the modern oil law were available that Gulf moved in the area with an exploration concession.

TABLE 1—Analysis of Gas Taken Near Oil Zone of Ragusa Field

Constituent	Mole %
Carbon dioxide	81.4
Oxygen	0.1
Nitrogen	2.5
Hydrogen	1.2
Methane	11.1
Ethane	1.2
Propane	1.1
C_4-C_5	1.4
Hydrogen sulfide	traces
	100.0

TABLE 2—CHARACTERISTICS OF RAGUSA'S CRUDE OIL

Color			Brown
Specific gravity at 15° C.			0.934
Gravity API			19.4
Viscosity at 100° F.			1259 secs.
Viscosity at 150° F.			395 secs.
Sulfur			2.4%
Chlorides as NaCl, lb./1,000 bbl.			1.0
Distillation			
Over at 200° C.	7.6%	Sp. gr. 0.755	S 0.03%
Over at 200°-250° C.	1.8%	Sp. gr. 0.815	S 0.15%
Over at 250°-270° C.	5.9%	Sp. gr. 0.840	S 0.25%
Above 270° C. residue	84.6%	Sp. gr. 0.965	S 2.73%
Carbon residue	7.5%		

On the completion of the 1 Ragusa as a producer, the concession was changed to a producing concession.

The original exploration concession was for 181,564 acres, but was reduced at Gulf's request to 131,890 acres in 1959. The area is still under active exploration.

Continuous development. The 1 Ragusa was put on production in December 1954, and by mid-1960 a total of 50 wells had been drilled. All but four of these are productive.

Total production to June 1960 was 29,389,000 bbl., with the 1959 production being 9,327,000 bbl.

Proven reserves for the field are estimated to be about 150 million barrels.

Gas composition varies. Solution gas-oil ratio has remained fairly constant at 180 cu. ft. per bbl. The field has a gas cap thought to contain several billion cubic feet of gas.

One of the unusual features of the gas-cap gas is the lack of uniformity of composition. This was first reported by F. T. Kafka and R. K. Kirkbride at the Fifth World Petroleum Congress. The carbon dioxide content increases from 15.1% at the top of the structure to 32% near the gas-oil contact. Table 1 shows an analysis of the gas taken near the oil zone.

Solution gas also changes in composition depending on structural location. That from the higher positions contains a lower percentage of CO_2 than that from the lower parts of the oil column.

Water-oil contact varies in depth from −5,000 ft. to −4,773 ft. Salinity of the water is high, and specific gravity is 1.0544.

Viscous oil. All wells in the field are on the pump because of the low viscosity of the oil. At 100° F. it is 1,259 S.U.s., and goes down to 395 S.U.s. at 150° F.

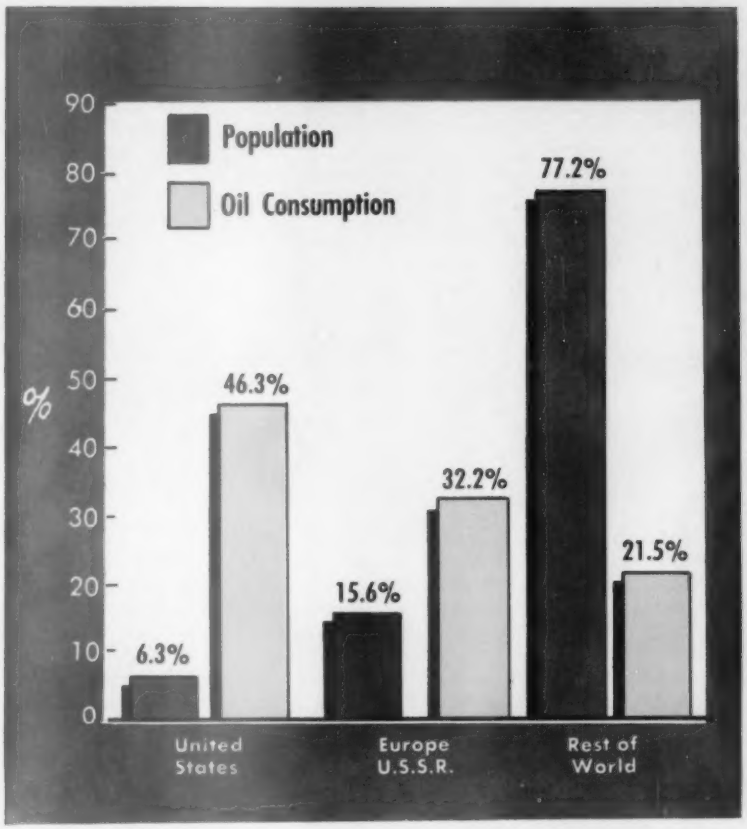
Other properties of the oil are given in Table 2.

Pipeline connections. Production from the field is fed into a 14-in. pipeline to Priolo tank farm, a distance of some 30 miles. Here the flow is split, one branch going to the sea terminal about 3 miles away for export, the other going to the refinery of RASIOM which processes oil for local consumption. Gulf Italia does not operate a refinery of its own.

Exploration unsuccessful. Gulf Italia, in partnership with other firms, has carried on exploration work in other areas of Sicily outside the Ragusa concession. But these have met with no commercial success.

One deep test well was drilled on the Ragusa concession. Total depth of No. 47 was 14,932 ft. Purpose of the test was to evaluate the formations deeper than the known producing zones, but the well was dry.

VIEW of Ragusa Ibla, old section of Ragusa.



LOW OIL CONSUMPTION by most of the world's population means . . .

World Oil demand should double by 1975

Use of oil and its products should steadily increase until 1980. After that time, consumption will depend on rate of discovery, ability to build facilities for handling oil, availability of other forms of energy.

BY SIR HORACE STEPHEN GIBSON

THE UNITED STATES, with 6.3% of the world's population, consumes 46.3% of the world production of petroleum; western Europe and the USSR together since they have about the same rates of consumption with 15.6% of the population, use 32.2% of the petroleum, while the remainder of the world, amounting to 77.2% of the population, consumes only 21.5% of the oil.

With these facts before us it is clear that world consumption of petroleum will continue to increase. Although there appears to be an excess of crude oil available at the present time, the problem, as Mr. Victor de Metz, president of Compagnie Francaise des Petroles, said at a recent meeting of that company, is really one of underconsumption.

Summary of paper presented at recent meeting, National Petroleum Association, U.S.A.

THE AUTHOR

Sir Horace Stephen Gibson, GBE, MA, MI Mech. E., is chairman of the Permanent Council of the World Petroleum Congress. He served from 1950 to 1957 as managing director of Iraq Petroleum Co. and associated companies. Gibson was associated with Anglo-Persian Co., Anglo-Iranian Oil Co., and Iraq Petroleum throughout his industrial career. In 1947 he was awarded the Redwood Medal of the Institute of Petroleum. He has been a member of the Council, Institute of Petroleum since 1949, and served as president 1952-54.

There is little doubt that the present excess availability of crude will vanish within three or four years if the world's rate of increase of consumption continues at the rate it has done since the end of the war.

Doubled consumption. But what of the more distant future. At the Fifth World Petroleum Congress held in New York in June 1959 three papers presented on the world's future requirements came to almost identical conclusions, that by 1975 the world would be using round about 40 million barrels of crude per day, equal to 15 billion barrels a year. The present annual rate of consumption is about 7½ billion so in the next 15 years consumption will be doubled. This appears to be a conservative estimate as the annual rate of increase to reach this amount is only 5-6% per annum, whereas for the last 10 years the actual rate has been 7%.

The present proved reserves of the world amount to about 275 billion barrels, which will meet consumption at this rate of increase until about 1980. The indications are that by that time the consumption of petroleum in western Europe and the USSR per head of population will have drawn level with that in the U.S.A. as it will be at that time, probably in the region of 35 bbl. per head, and that total world requirements will be of the order of 18-20 billion barrels a year.

At that stage one feels that the rate

"The discovery of petroleum seems to come in waves."

of increase must then fall off somewhat, but we have to remember that the populations of these three regions are growing at about 1¾% per annum, or doubling every 40 years, so demand will undoubtedly continue to rise, though at what rate we cannot say as yet. So much will depend upon the amount of capital the present underdeveloped countries can find. Capital is necessary to enable a country to make use of petroleum or any other form of energy, and so make progress.

After 1980, what? What will happen after 1980 is pure speculation. By that time, the present proved reserves will have just about been used. During the next 20 years, however, more crude will be discovered. Although the Middle East is estimated to contain about 175 billion barrels of the world's total of 275, it does not appear to me likely that it will be able to add more than say another 75 billion by 1980. If we allow for the discovery of another 200 billion in the remainder of the world, which is not an unreasonable figure, we shall have in 1980 the same amount of proved reserves as we have today, but the rate of production will be more than twice what it is at the present time.

It is anticipated by many that the efficiency of recovery of crude from reserves will be greatly improved in the coming years, that instead of a recovery of some 30 to 40% it will be nearer 90%; this of course would have a tremendous effect. There is also the possibility that a more intensive search for oil will find it, particularly in those regions outside North America. Here I am rather doubtful. The search for oil in the U.S.A. has been carried out far more intensively than anywhere else. Although geology and geophysics have played a great part in finding oil here, a very large proportion has been found by the wildcatter.

Only in Canada and the U.S.A. is is possible for wildcat wells to be drilled by individuals, and even in Canada the cost restricts this type of operation. In the U.S.A. any man with a hunch and a few thousand dollars can have a gamble, and the security of reward to private enterprise encourages him.

Oil Finding Costly

Wildcat drilling in other countries died out many years ago. The cost of drilling a well in a remote area is so high that more definite evidence than an individual's belief in success is required. It is interesting to note that the well which discovered oil in Iran was a wildcat, drilled by a retired civil engineer, G. B. Reynolds, in 1908. He had drilled several dry holes on geological locations in the previous 7 years, and finally he himself selected the location at Masjid-i-Sulaiman which found oil. He must have had a remarkable instinct, for he also drilled the first well to produce oil in Venezuela.

Even at that time the cost of finding oil in Iran was very high. W. K. D'Arcy, who financed it, spent over 4 million dollars of his own money and had to get other support before the oil was found. The discovery and production of foreign oil is very expensive, and generally speaking beyond the resources of individuals. One case in my own experience is of a field in which oil was found with the first well, labor was plentiful and easy to get, as there was a large town within 15 miles, as also was fresh water in unlimited quantity.

Deep water for a sea terminal was only 70 miles away. With all these advantages an expenditure of 50 million dollars was needed before the first barrel of oil was exported. Without these advantages it could well have been 100 or even 150 million dollars. In spite of such enormous costs, large-scale operation enables crude to be produced cheaply, provided the field is big enough.

If the aggregate rate of production from an area is below a certain level, the cost per barrel is too high to be competitive. For a remote area I would be inclined to say that the production would need to be about 100,000 bbl. a day to be really competitive at the present time. I am sure that a production of 20,000 bbl. in a thinly populated country and some 300 or more miles from an outlet would be uneconomic, especially if of high viscosity.

Discovery patterns. The discovery of petroleum seems to occur in waves; throughout my experience in the industry we have either had periods of overavailability or a threat of scarcity, either feast or threatened famine. Companies operating under these conditions need considerable financial reserves to carry them through and considerable restraint in production must be exercised when large amounts of oil become available. The temptation quickly to recover money invested leads to low prices which reduces the rate of discovery and development.

Discovery and development take so much longer than in the U.S.A. that investment for the future must still continue when crude is plentiful. This investment averages for a number of companies about $1.50 on each barrel of present production, and takes care of the increased production required at some point in the future. In round figures it is provided 60% from depreciation, 30% from retained earnings, and 10% new capital. With steadily increasing quantities produced, additional working capital is also needed and this may take another 35% or so from earnings, making the total reinvestment from that source 65%.

When we relate these amounts to the production of 18 or 20 billion barrels in 1980 one is rather staggered by the amounts, but it is the material side which may present the problems. Without going into details the industry's steel requirements will be very large as also will the shipping of these quantities of oil. Tankers already amount to 40% of the world's shipping; in 20 years it will be 60 or 70%.

Demand after 1980. When planning production it is advisable to always try to look about 20 years ahead. We can see up to 1980 reasonably clearly, but beyond that is at present very much in the nature of guesswork. The rate of increase of consumption will probably be slowing down, at any rate in the present major consuming areas of North America, western Europe, and the USSR, but we have to remember that the populations of these areas are growing, being doubled about every 40 years.

This alone calls for an annual increase of total consumption of 1.75% per annum, so from 1980 onwards a world consumption increase of 3.5% as compared with the present 7.0% does not seem too wildly speculative. By the end of the century that would bring the world to something like 100 million barrels a day.

Whether there is sufficient oil in the world to enable consumption to grow to these quantities no one can say. One thing, however, may help us. The United States is away out in front in the amount of oil it has discovered and produced per thousand square miles of area, and no other area will ever equal it. When the U. S. rate of discovery begins to fall off it will be an indication to all other producing areas what their own ultimate production will be.

SEISMIC SHOOTING in metropolitan France has its problems. Numerous farms and highways influence orientation of shot points.

French move to meet soaring demand

Exploration stepped up both in homeland and in North Africa

WESTERN EUROPE'S petroleum potentialities have not always been considered as good as they now are and, until recently, the oil industry was primarily engaged in refining and marketing. Though much of the European continent does have marine sediments with both reservoir and cap-rock potentialities, other areas have been more attractive.

France exemplifies the condition just described. Geologically the oil potential of both metropolitan France and North Africa was not attractive, there were bigger "plums" elsewhere and, with the United States the prime consumer, there was little reason to consider the eventual market conditions. French internal consumption has increased 400% in the last 20 years and in fact the last 15 years, as the figures for 1939 and 1946 are practically identical at 37,000,000 bbl.

The possible petroleum basins in France had not interested companies in exploration and the prospects were dim that the situation would change. Therefore, a solution was found internally by allocating public funds as risk capital to stimulate interest. The effort began before World War II but did not gain momentum until after 1945. As a matter of record, the Centre de Recherches de Petrole du Midi (CRPM) was established in 1937 and drilled the discovery gas well at Saint Marcet in 1939; the production in 1959 was 9,700,000 M.M.c.f.

The history of oil production in France is the story of close cooperation of government and private enterprise. It is possible that the cooperation has been too close, so that the private companies have, from an external viewpoint, come to be grouped, categorically, with the government companies. Actually, the government has provided the supervision, influence, and incentive to stimulate the expansion and activity of the many private companies involved.

Domestic production was long needed. Oil production in the Paris basin and in the Algerian Sahara became a reality in the past 18 months and brought to an end one phase of a carefully planned program for a petroleum-production industry. World War II had painfully proved that French economy depended upon sources of petroleum energy within the franc zone and, if possible, within France proper. Before World War II, France produced approximately 1.4% of her own petroleum requirements, primarily from Pechelbronn in Alsace-Lorraine. Postwar consumption and production in 1946 were in the same ratio; consumption being around 37,000,000 bbl. and the domestic production only 410,000 to 450,000 bbl.

There can be little doubt that the program of the Bureau de Recherches de Petrole (BRP) has been accomplished. It is equally true that the purpose of the program was valid and justifiable as it was based on the same arguments used to support the domestic production and import quota system in the United States. It is improbable that any other course could have produced the results that were envisioned and which have been achieved. France, as an oil province, was considered a probability but, in

BY RICHARD F. HAGEMANN

. . . technical adviser for geophysical operations for Compagnie Generale de Geophysique. Hagemann received a geological - engineering degree (geophysics) from Colorado School of Mines in 1948. For 8 years he was employed as a research geophysicist by Sun Oil Co. before making his present connection.

FRENCH FIELD AND RESERVOIR DATA

Field name and location (basin)—	Date	Discovery well	Method		Formation	Area (acres)	Prod. thickness (ft.)	Type	No. of wells	Cum. prod. (bbl.) 4-30-60	Reserves, bbl. or cu. ft.*	Gravity API	Remarks
Metropolitan France Gas Fields													
Charlas (Aquitaine)	1960	Charles 1	n.a.	9,040	L. Cretaceous	Undev.	56	.....	1	Prod. test.	Unknown	...	17.5 M.M.c.f.d.
Lacq Inferior (Aquitaine)	1951	Lacq 3	New pool ext.	11,700	Neocomien Portlandian Kimmeridgian	16,000	2,000	.....	35	158,000	6,300 billion	...	.....
Saint Marcet (Aquitaine)	1939	.....	n.a.	4,925	.....	1,730	...	.....	16	.....	10 yrs. add.	...	Current prod. 0.7 to 1.0 M.M.c.f./month
Algerian Sahara Oil Fields													
Bordj Nili (Mole de Tilrhemt)	1959	Bordj Nili 2	Geology	8,250	Muscovian	Undev.	n.a.	n.a.	1	Shut in	Unknown	n.a.	3 offsets dry
Collenia Dome (Fort Polignac)	1958	1 DC	n.a.	3,173	Ordovician	Undev.	63	n.a.	1	Shut in	Unknown	n.a.	First Ord. oil in Fort Polignac basin
Edjele (Fort Polignac)	1956	D1 101	Geology	1,380 2,290	Carboniferous Devonian	.....	59-98 98	.....	88	Shut in	224 M.M.	40	.....
El Adeb Larache (Fort Polignac)	1958	El Adeb Larache 1	Geology	4,100	L. Devonian	Undev.	52	Expansion	8.4	Shut in	2.6 M.M.	43.3	.....
Hassi el Gassi (L'Oued Mya)	1959	Hassi el Gassi 1	Refrac. seis.	10,470	Cambrian	Undev.	295	n.a.	3	Shut in	Unknown	43.2	3 offsets dry; 3 extensions drilling
Hassi Messaoud (L'Oued Mya)	1956	Hassi Messaoud MD-1	Refrac. seis.	10,900	Cambrian	500,000	460	Expansion	60	26,000,000	75 M.M.	43	48 million bbl. production planned 1960
Ikebrane (Fort Polignac)	1958	Skb 1	Geology	1,640	Devonian	Unknown	10	Unknown	1	Shut in	Unknown	41	Not being developed
In Azzene (Fort McMahon)	1959	In Azzene 1	n.a.	2,378	L. Devonian	Unknown	40	n.a.	1	Noncommercial	Insig.	43.2	First W. Sahara oil well
Ohanet (Fort Polignac)	1960	Ohanet 1	n.a.	7,700	L. Devonian	Undev.	229	n.a.	*2	Prod. test.	Under dev.	45.5	Disc. potentialed at 1,088 bbl./day
Ouan Taredjeli (Fort Polignac)	1959	Ouan Taredjeli 1	n.a.	4,865	Carboniferous Devonian	Undev.	200	n.a.	2	Shut in	Under dev.	n.a.	Ten pay zones gas, dist., and oil
Ouan Tareder (Fort Polignac)	1958	Trt 1	Geology	4,872	Cambro-Ordovician	Undev.	76	n.a.	1	Shut in	Under dev.	n.a.	Tested 38.5 bbl./hour
Oued Zenani (Fort Polignac)	1960	.....	n.a.	n.a.	Devonian	Undev.	n.a.	n.a.	1	Shut in	Under dev.	n.a.	Tested 157 M.c.f. gas in Ord. at 6,147 ft.
Tiguentourine-La Reculee (Fort Polignac)	1956	Tg 101	Geology-geophysics	1,640	Carboniferous Devonian	3,200	1,000	Expansion water dr.	13	Shut in	560 M.M.	n.a.	Wet gas in Ord., 4,600 ft.
Zarzaitine (Fort Polignac)	1958	ZR 101 gas ZR 1 oil	Seismic	1,640	Devonian Carboniferous	12,800	52	Expansion water dr.	57	Shut in	63 M.M.	43	Six producing zones

NOTE: The In Amenas-La Skhirra 24-in. pipeline from the Fort Polignac area is scheduled for operation on October 1, 1960.

Algerian Sahara Gas Fields

Hassi R'Mel (L'Oued Mya)	1956	Hassi R'Mel 1	Seismic	7,000	Triassic	600,000	n.a.	.....	8	Shut in	63 M.M.M.*	...	Pipeline under const.
Numerous wildcats throughout the Sahara have found both wet and dry gas but are not considered to be sufficiently important to be tabulated above.													
Bolwiller (Rhine Graben)	1957	Bolwiller 1	Seismic	5,900	Grande Oolithe	49	131	Water dr.	1	Insig.	Insig.	...	Fault, 18 B/D
Cazeaux (Aquitaine)	1959	Cazeaux 1	n.a.	7,800	Albian, Aptien	Undev.	249	n.a.	6	206,279	Under dev.	...	.....
Chailly en Biere (Paris)	1958	Chailly 1	Reflec. seismic	5,350	Bathonian Dogger	Undev.	5-20	Water dr.	32	427,000	Under dev.	34.8	Structure under dev.
Chateaurenard (Paris)	1958	Chateaurenard 1	Reflec. seismic	1,860	Neocomian	740	3-16	n.a.	4	168,800	n.a.	27.4	.....
Coulommes (Paris)	1958	CS 1 Coulommes 1	Core drill and refl. seis.	6,150	Upper Dogger	3,500	66	Water dr.	29	1,703,000	30 M.M.	32.6	Anticline and strat.
Eschau (Rhine Graben)	1956	ESCHAU 2	Seismic	2,950	Grande Oolithe	321	163	n.a.	7	140,000	185,000	...	Fault
Gallician (Rhone)	1951	Gallician 1	Refl. seis. and gravity	5,900-6,500	Olig., Eoc., Cret.	n.a.	3-13	n.a.	2	n.a.	225,000	...	Fault
Lacq Superior (Aquitaine)	1949	Lacq 1	Gravity and refl. seis.	2,130	Senonian	990	460	Water dr.	30	24,000,000	3 M.M.	...	Anticline
Lucats (Aquitaine)	1956	Lucats 1	Seismic	6,730	L. Cretaceous	98	153	Water dr.	1	Insig.	Insig.	...	Approx.; 90 B/D, fault
Lugos (Aquitaine)	1956	Lugos 1	Seismic	4,750	L. Cretaceous	533	153	Water dr.	6	673,579	3.2 M.M.	...	Fault
Mimizan (Aquitaine)	1960	1 Mimizan N	n.a.	4,950	Albian	Undev.	n.a.	n.a.	1	7,000	Under dev.	11.3	Reef limestone
Montmirail (Paris)	1959	Montmirail 2	n.a.	6,070	Dogger	Undev.	n.a.	n.a.	1	Insig.	Unknown	n.a.	Shut in
Mothes (Aquitaine)	1955	Mothes 1	Seismic	7,870	L. Cretaceous	480	75	Water dr.	4	1,217,000	3.5 M.M.	n.a.	Anticline
Parentis (Aquitaine)	1954	Parentis 1	Gravity and seismic	7,800	L. Cretaceous	7,420	1,145	Water dr.	29	40,763,000	135 M.M.	n.a.	Fault
Pechelbronn (Rhine Graben)	1866	Unknown	Seeps	Various	Various	n.a.	n.a.	n.a.	n.a.	25,000,000	Virtually depleted	n.a.	Old field
Renigue (Rhine Graben)	1955	Renigue 1	Seismic	4,590	Rauracien	200	66	Water dr.	3	.....	.....		
Saint Firmin des Bois (Paris)	1960	.....	n.a.	1,845	Neocomian	.....	n.a.	n.a.	1	Testing	Unknown	n.a.	.....
Saint Martin de Bossenay (Paris)	1959	.....	n.a.	4,500	Dogger	Undev.	200	n.a.	9	500,000	15 M.M.	33	.....
Scheibenhard Inferior (Rhine Graben)	1956	Scheibenhard 2	Seismic and electrical	3,110	Sannoissien	250	6	Water dr.	6	250,000	300,000	n.a.	Fault
Scheibenhard Superior (Rhine Graben)	1956	Scheibenhard 3	Seismic and electrical	1,800	Stampien	250	17	Water dr.	11	300,000	670,000	n.a.	Fault
Schirrhein (Rhine Graben)	1954	Schirrhein 3	Seismic	1,640	Sannoissien	170	7	Water dr.	2	35,000	Depleted	n.a.	Fault
Soufflenheim (Rhine Graben)	1954	Donau 8	Seismic	1,640	Sannoissien	420	7	Water dr.	12	220,000	Depleted	n.a.	Fault
Staffelfelden (Rhine Graben)	1951	DP 25	Core drill	6,230	Grande Oolithe	120	130	Water dr.	2	400,000	Depleted	n.a.	Fault
Villemer (Paris)	1959	Villemer 101	n.a.	4,999	Bathonian-Dogger and Lusitanean	Undev.	40	n.a.	5	60,000	Under dev.	31.5	(?)

contrast, the potentialities of Latin America and the Middle East were much more attractive to the established international oil companies. France provided the incentive and the risk capital through the BRP, and although other government-sponsored oil agencies have failed to achieve their purpose in other countries, in France the planning has been successful.

With the central organization available for investment and planning, an immediate exploration program could begin. France was not without experienced petroleum engineers, geologists, and geophysicists. The elements of a production group had gained worldwide experience from the efforts of Compagnie Francaise des Petroles, Pechelbronn Societe Anonyme d'Exploitation Miniere, Regie Autonome des Petroles, Societe de Prospection Electrique Procedes Schlumberger, Compagnie Generale de Geophysique, and others.

This small number of technical personnel has been augmented by graduates of specialized schools and training groups established by the BRP and the Institut Francaise du Petrole as well as by private industry groups. The BRP was established in 1945; it had been preceded by other government supervisory organizations but none which had been given the broad program entrusted by the BRP. The basins to be tested were very large question marks and the maximum depths of the sediments were unknown. The shape and form of the basins were very poorly defined and major unconformities should be expected. Layer-cake geology was not easily divulged.

Geophysical activity picks up. The nascent geophysical industry was asked to find the sedimentary extent of the probable major basins, the thickness of the section, and the location of suitable structures for drilling. Geophysics had been available in France since the earliest experiments of Conrad and Marcel Schlumberger, but the incentive to develop a major industry had been lacking. Given this chance to prove the efficacy of applied geophysics, the integrated efforts of all the technicians were directed toward a program of total exploration.

French oil-production history is a geophysical case history—not a case history of an oil field or an oil province, but the case history of an oil-production industry. The first year for which valid geophysical statistics were available is 1948, when a total of 143 crew-months was completed; this represents 83 crew-months of gravity and magnetic surveying (58% of the total), 30 crew months of electrical and telluric-current surveying (21% of the total), and 30 crew-months of seismic surveying.

At first these figures would appear quite odd if compared with the geophysical industry in the United States, but two factors account for the crews used—the type of experienced geophysical personnel and equipment available, and the reconnaissance nature of the surveys. All methods of geophysical prospecting were used successfully and have continued in use through the 11 years that have elapsed. Electrical and telluric-current methods increased from 30 crew-months in 1948 to a peak of 72 crew-months in 1951 and then declined steadily until now. At least one crew is currently employed in metropolitan France using electrical methods.

Gravity-meter and magnetometer surveys through the period 1948 to 1952 were related stable at 80 crew-months for each year. The activity in North Africa had begun to be organized and a steady growth in operation began in 1952 and continued until 1956 when a peak of 185 crew-months was reached. Since 1956, gravity-meter operations have declined sharply to the level of 70 crew-months per year.

Reflection and refraction seismograph operations rather quickly gained momentum and a continued growth existed from 1948 until 1958. In 1959 a decrease in crew-months of seismograph operations occurred. This marks the change in emphasis from exploration to development and exploitation of the areas both in France and North Africa. A peak activity of approximately 750 crew-months was reached in 1958. It has taken 12 years to produce the desired effect but the results have been positive and are evident. French production capacity has increased rapidly since December 1959 when the Haoud-El-Hamra to Bougie pipeline began delivery of

(Continued on page 113)

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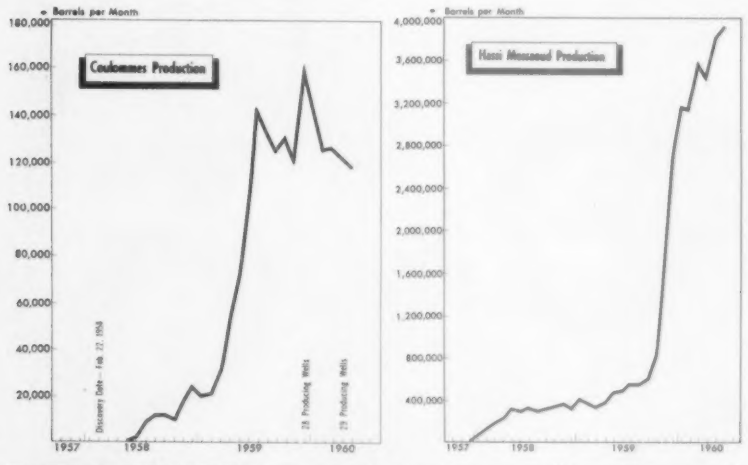

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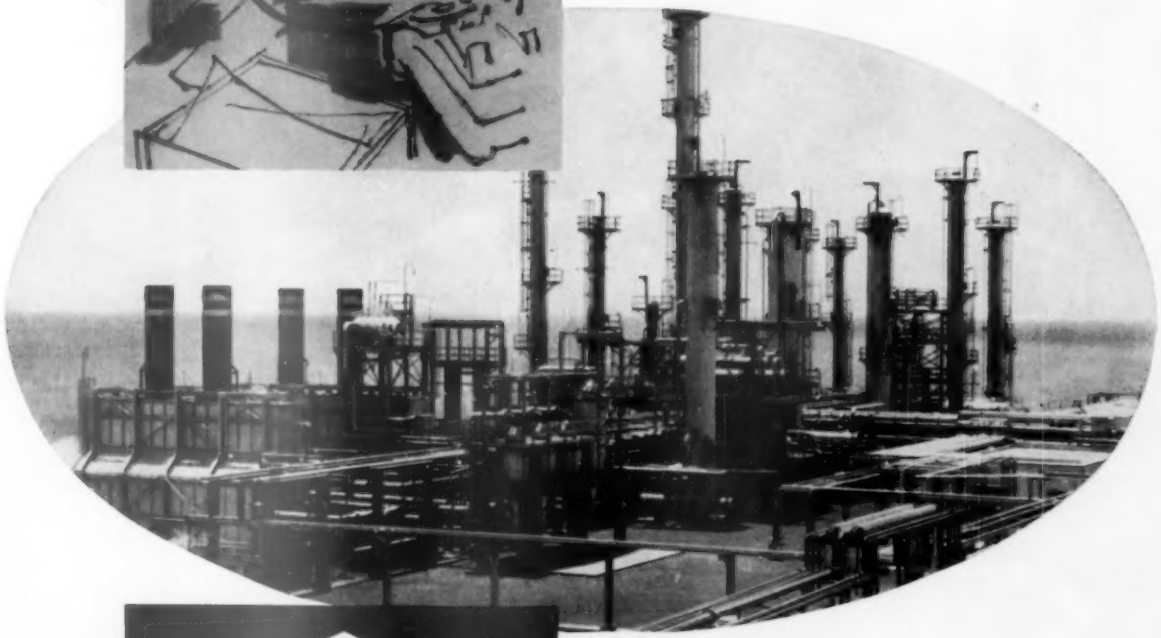

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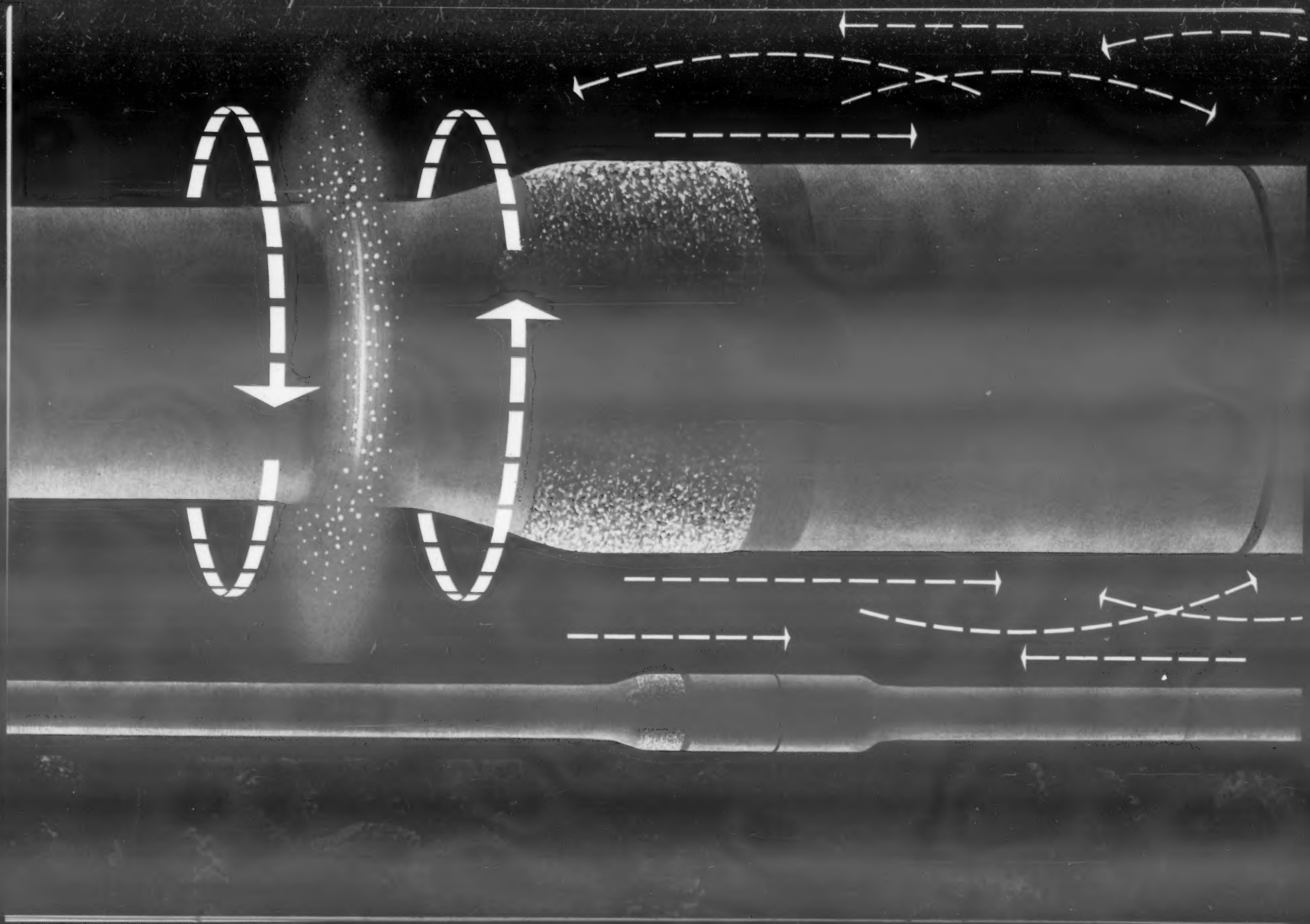

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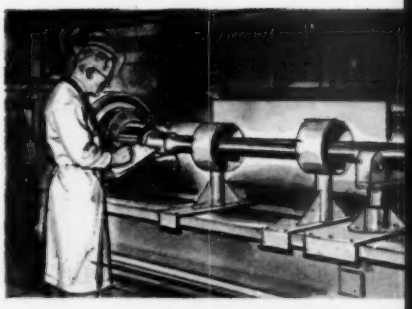

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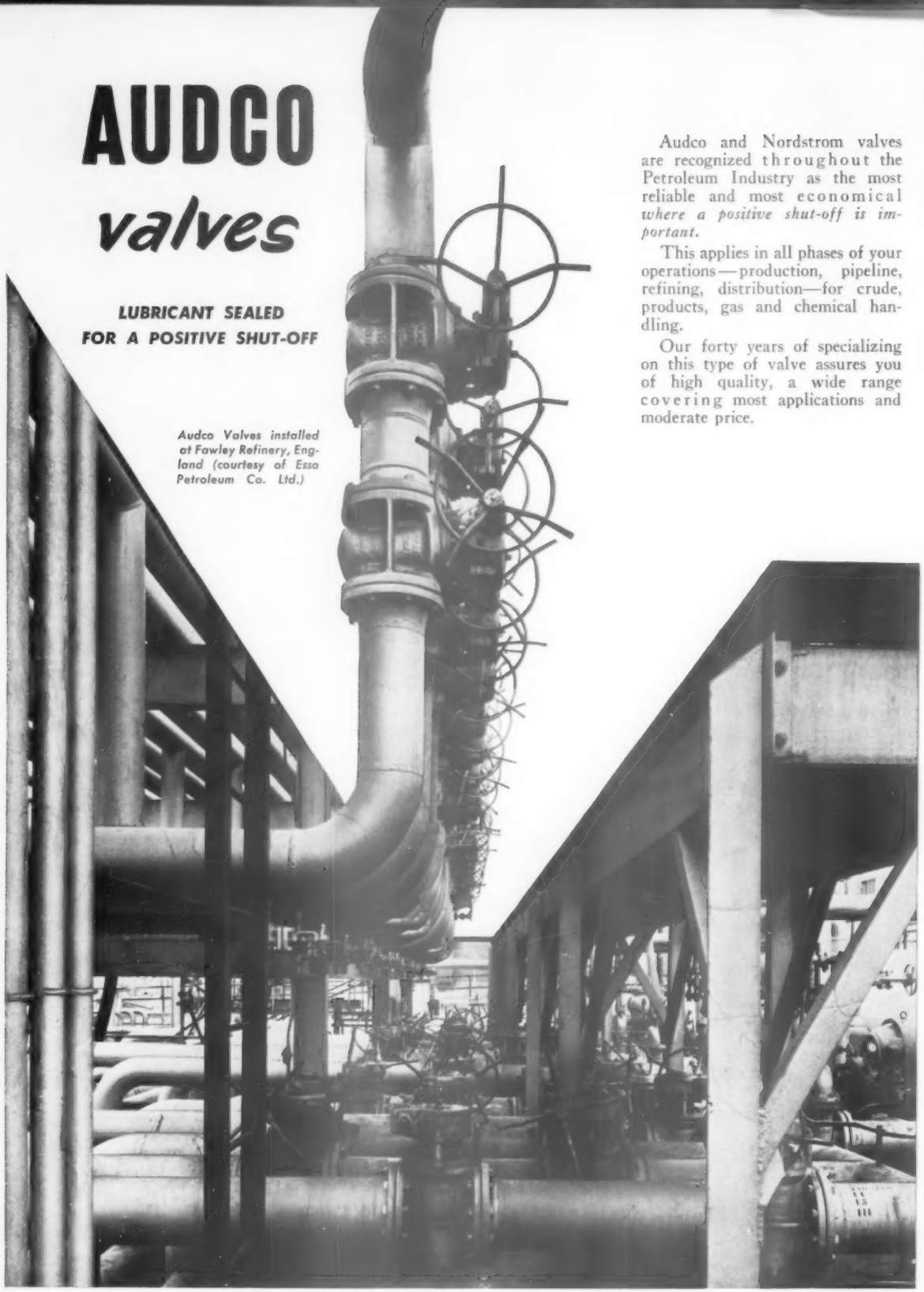

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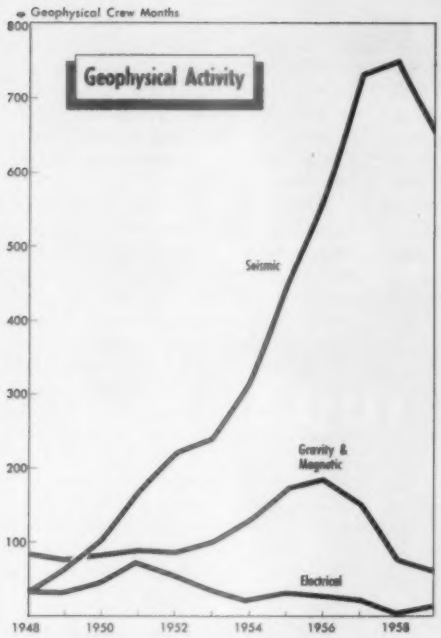


THE FRENCH have been busy as beavers at home in their over-all geophysical exploration effort.

LAYER-CAKE GEOLOGY complicates interpretations in many areas of France. Careful migration of seismic data is imperative.

Hassi Messaoud crude. The current throughput of the pipeline is close to 4,000,000 bbl. per month or about 20% of French refinery capacity.

In metropolitan France, production is also climbing steadily, showing the influence of the developments in the Paris basin. Recent production has been 1,200,000 bbl. per month.

The pipeline from the Edjele area to Tunisia will be in operation by early October 1960. The 487 miles of 24-in. pipe will have an initial capacity of 4,000,000 bbl. per month. The terminal in the Edjele area at In Amenas and the terminal at La Skhirra are largely finished and ready to operate. This pipeline will bring into regular production an area that has been shut in since the first discovery at Edjele in 1956. During these 4 years, drilling activity has been at a very high level developing the many fields discovered, new producing horizons that have been found, and in exploratory drilling.

The total deliveries from France proper and from Algeria will be approximately 10,000,000 bbl. per month at the end of 1960. As additional pumping facilities are installed on the two Algerian pipelines, the deliveries will increase to 100% of French consumption.

The large Hassi R'Mel gas field will soon be opened to production as the pipeline connecting the area to the Mediterranean nears completion. The natural-gas potentials of the Sahara are unknown but enough wells have found gas in sufficient quantities to justify serious consideration of transportation methods. These will span the Mediterranean now separating the gas from the market area in Europe. It may be that submarine pipelines will be feasible at the Straits of Gibraltar, Balearic Islands, or from Tunisia via Sicily through Italy. Parallel planning for liquefication and shipment by surface vessels is contemplated.

Metropolitan France. Metropolitan France contains four areas that have been the subject of geological and geophysical activity: the Rhine Graben, the Rhone Valley, the Paris basin, and the Aquitaine basin.

The Rhine Graben historically is one of the oldest oil-producing areas in Europe and one that was considered to have great potentialities. Unfortunately, the oil fields that have been found have not supported the hopes for the area and interest has subsided. The Rhone River Valley also has failed to show great promise and, though drilling activity and geophysical operations continue there, the companies holding concessions are focusing their attention elsewhere.

The Paris basin has within the last 18 months regained the interest of the companies holding concessions, although the area had failed to live up to expectations after extensive geophysical and geological surveys. Although subsequent wildcats had found widespread indications, they were invariably associated with a high percentage of connate water.

In February 1958, PETROREP (Societe Petroliere de Recherches dans la Region Parisienne) completed the Coulommes 1 CS for the first Paris basin commercial production; the field is as yet not fully developed, though it has 29 producing wells including the 21 BF potentialed at 5,000 bbl. per day.

In 1958, Coulommes was followed by discoveries at Chailly-en-Biere, Brie, and Chateaurenard; in 1959, at Montmirail, Saint Martin de Bossenay, and Villemer; in 1960, at Saint Firmin des Bois, Rigny la Nonneuse and Gisy les Nobles.

In the Aquitaine basin, the discovery history has been older (Saint Marcet was discovered in 1939), more continuous (Lacq Superior in 1949, Lacq Inferior in 1951, Parentis in 1954, Mothes in 1955, Lucats and Lugos in 1956, Charlas and Cazaux in 1959, and Mimizan in 1960), and more spectacular (Lacq Inferior gas reserves are 6,300,000 M.M.c.f. recoverable and Parentis reserves are 135,000,000 bbl. recoverable).

Paris basin oil fields. Coulommes was discovered in February 1958 as the result of an extensive reflection seismic program coupled with a core-drill program. The field has been under continuous development and currently has 29 producing wells out of the 34 drilled.

The company holding the Dammar-

tin permit on which Coulommes is located is PETROREP, an entirely private corporation.

Production is found in the Upper Dogger-Jurassic formation at a depth of 6,150 ft.; the pay zone is 66 ft. thick. The potential production of the wells is dependent upon structural position to some extent but variation in porosity and permeability are more important factors.

A cautious development program has been followed by the operator, and the field may continue to extend northeastward some distance, but the main producing area has been set at 3,500 acres. The estimated recoverable reserves are 30,000,000 bbl. with annual production set at 1,800,000 bbl. The cumulative production through the 26 months' history ending April 30, 1960, was 1,700,000 bbl. Since August 1959, the field has been producing an average of 125,000 bbl. per month. The rapid rise in production in the last 6 months of 1959 is coupled with the rapid completion of the development wells and with the completion of the gathering system that delivers the production to barges on the Marne River through a 6-in. pipeline.

PETROREP is continuing to explore the concessions held in the Paris basin with the same program of coordinated geology and geophysics using core-drill and reflection seismograph crews. The interpretation requires careful consideration of velocity variations and the logging of continuous velocity information.

Chailly-Brie is located some 60 km. south-southwest of Paris in the Forest of Fontainebleau (CEP) completed the discovery well of Chailly-en-Biere in October 1958; it was located at the extreme eastern edge of the "Etampes" permit west of the Seine River.

In February 1959, RAP completed the discovery well at Brie, at the extreme western edge of the "Chalons-sur-Marne" permit.

Originally, the operating companies considered the fields to be separate and distinct; development drilling indicates that the reservoir and oil characteristics are similar and that the two fields are probably on the same structure. In some reports, the Brie area has been named the Chartrettes area.

Chailly-Brie is being continuously developed by the two operators and, as of April 1960, 23 producing wells had been drilled by CEP and 9 by RAP. The production is found in the Bathonian member of the Dogger formation at a depth of 5,350 ft. The reported figure is 34.8° API gravity for the crude. Cumulative production for the combined area is near 500,000 bbl. Recoverable reserves have not been announced as the field has not been completely developed and wide variations in individual wells affect estimates. The monthly production is currently about 65,000 bbl. but is increasing at the rate of 10,000 bbl. per month. The discovery is credited to a reflection seismograph survey.

On the same permit as Brie field, RAP drilled the discovery well at Villemer in 1959. It lies in the extreme southwest corner of the "Chalons-sur-Marne" permit, northeast of the town of Nemours. Production is found both in the Middle Jurassic-Dogger and in the Upper Jurassic-Lusitanian formations below 5,000 ft. The oil is 31.5° API gravity. Five wells have been completed and the field is still under development. Monthly production is about 20,000 bbl. and increasing at a monthly rate of 3,000-4,000 bbl. as new wells are completed.

The production is being trucked to Melun near the Brie area on the Seine River at which point it is transferred to barges for transportation to the refineries near Le Havre and Rouen. At present, all Paris basin oil is being refined either at Le Havre or Rouen. A refinery in the Paris area is being planned by PETROREP now that sufficient crude is available nearby.

To the east of the Villemer area, Compagnie des Petroles du Sud-Est Parisien (COPESEP) discovered Saint Martin de Boussenay field in 1959. COPESEP is a Royal Dutch-Shell company. The production is in the Dogger formation at 4,500 ft. Nine wells have been completed on pump and additional wells are being completed at the rate of one per month. Current production is about 65,000 bbl. per month. COPESEP has not released any estimates of the recoverable reserves.

The company has two other possible discoveries on the same permit, "Aube - Yonne"; near the town of Gisy-les-Nobles, in June of 1960, drillstem tests gave about 10 bbl. of oil in 2 hours. At Rigny-la-Nonneuse, near the Saint Martin de Bossenay area, a small commercial well was completed, possibly a new pool discovery or an extension of Saint Martin de Bossenay field.

Chateourenard field has proved to be a very small oil field of only 740 acres. It is historically significant as one of the earliest Paris basin oil fields and the first to prove productive in the Neocomian (Lower Cretaceous) formation. The discovery well was completed in April 1958, 2 months after the completion of the first well at Coulommes.

Located on the permit of Montargis south-southwest of Paris, in the area famous for the chateaux of the Loire, by "France-Outre Mer de Prospections et d'Exploitations Petrolieres S.A.F." (FROPEX), the field has a cumulative production of less than 100,000 bbl. of 27.4° API oil.

The wells that have been drilled indicate that production is controlled largely by the reservoir characteristics and to a smaller degree by structural position. Information on the Paris basin oil fields shows that stratigraphy is a very important factor governing the production and that wide variations in porosity and permeability occur within a very small distance. The field discovery is credited to a reflection seismograph survey.

At Saint Firmin des Bois near Chateaurenard field, FROPEX has a possible discovery for 1960, also in the Lower Cretaceous-Neocomian formation at a depth of 1,845 ft. The well tested 24 bbl. per day.

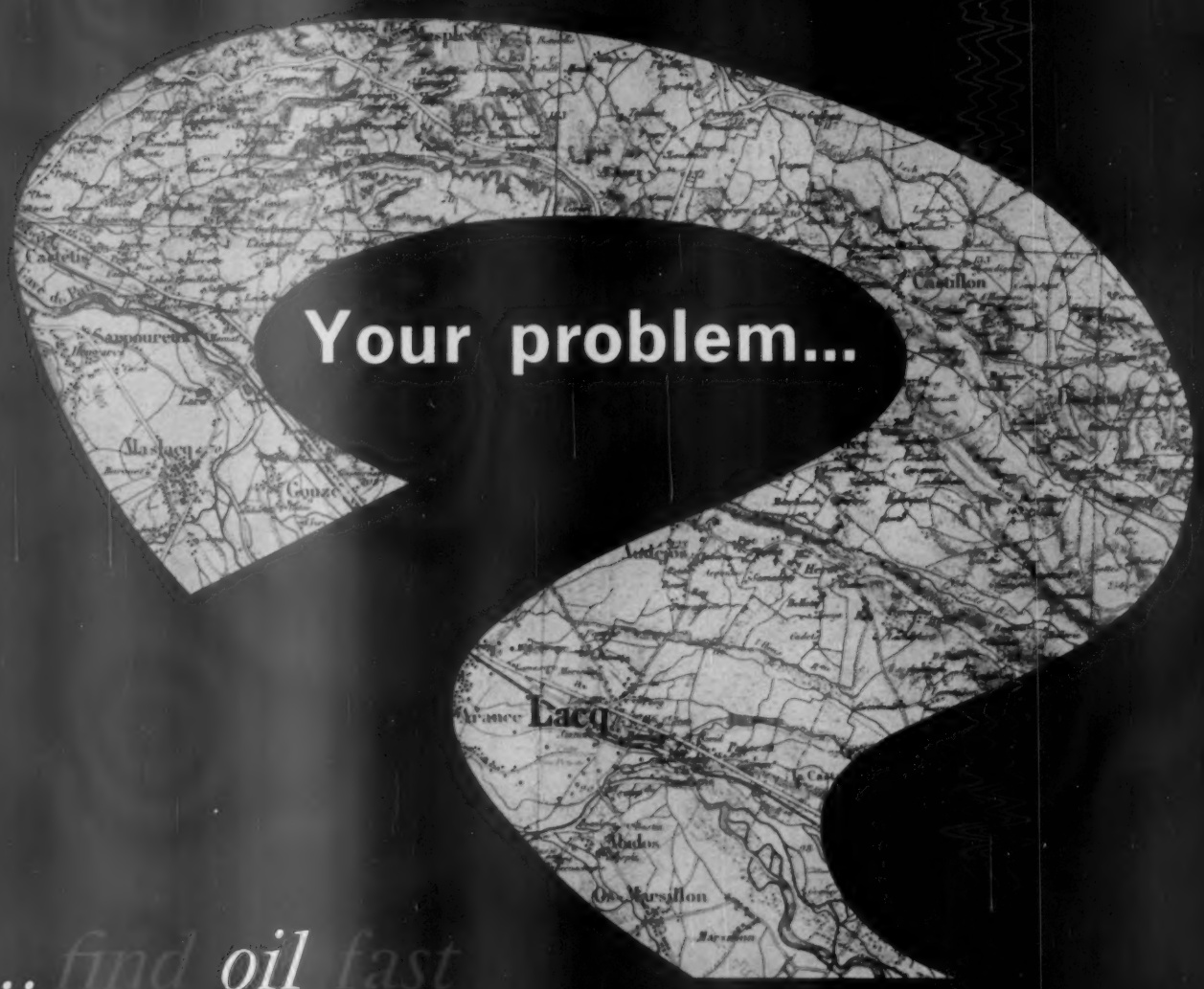
Aquitaine basin oil fields. Cazaux is developing rapidly as an important oil field for the Societe Esso de Recherches et d'Exploitation Petrolieres (Esso REP). The discovery well was completed in April 1959 with commercial production in the Lower Cretaceous Albian and Aptian formations. The Albian is found at depths of 7,200 to 8,500 ft. and the Aptian at 7,900 to 8,600 ft.

The initial development program of 10 wells is rapidly being completed. Six wells were drilled in the first year and the remaining four are to be finished by the end of 1960. The monthly production is continually increasing and is over 60,000 bbl. per month; individual wells are being produced at 300 bbl. per day.

The production is a significant addition to the total production in the Aquitaine basin which had been decreasing at a slow rate as Upper Lacq field nears depletion and Parentis production is carefully controlled. Esso has found commercial production in the Mimizan well during 1960; the discovery 1 Mimizan N was completed for 160 bbl. per day, but the offset well, 2 Mimizan, was dry and abandoned. The production is from an Albian reef reservoir at 5,000 ft.

Esso also used commercial production from Mothes, Lugos and Lucats discoveries prior to 1959.

The only other commercial discovery in the Aquitaine in 1959 was a gas-distillate well at Charlas near St. Marcet by RAP. The extent of the field is not known but is probably small. The production is processed at the Boussens unit which treats the St. Marcet gas. The area is 2 miles northwest of St. Marcet field.



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Map drawn and edited by the Institut Géographique National.

Parentis - Lacq
Hassi-Messaoud - Zarzaïtine
Tiguentourine - Hassi R'Mel

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Lacq gas-field development has been completed by SNPA as the last well on schedule has been completed. The reserves of sour gas at Lacq have been estimated at 6,300,000 M.M.c.f. by some authorities, but it is possible that extended production will show that the figure has been too optimistic.

North African oil fields. In Algeria, exploration activity has been overshadowed by the program of developing the oil fields that have been found in previous years and by the construction of the pipelines to the Mediterranean. Geophysical activity declined slightly from the previous high level in 1958, particularly in the number of gravity crews. Geophysical expenditures did not decline, however, as the crews began operations in the erg areas with more difficult and expensive problems to resolve.

Hassi Messaoud was discovered in June 1956 by SN REPAL at the MD 1 well and has proved to be a major oil field.

The first confirmation well drilled by Compagnie Francaise des Petroles (Algerie), the OM 1, was completed in May 1957. In April 1960, the two operators had completed 60 producing wells of the 65 locations drilled.

Production comes from a highly faulted anticline that was found as the result of a refraction seismograph survey. The Cambrian-sandstone reservoir is found at a depth of 10,900 ft. The porosity and permeability are extremely variable and are generally very poor, so that the ultimate recovery by primary means will be 3,500,000,000 to 4,400,000,000 bbl. from an estimated 26,000,000,000 bbl. in place. Certainly this is a giant oil field and it is regrettable that the reservoir is not more favorable.

The first deliveries from the field were made in January 1958 through a 6-in. pipeline to Touggourt and then by railroad to Philippeville. The 10,000,000 bbl. that went this route permitted extensive production tests of the wells that were then completed. At present, the deliveries are constantly mounting as additional wells are connected to the gathering system. In May, nearly 4,000,000 bbl. were produced.

Hassi Messauod oil fails in one other point to be an ideal oil: its gravity is 43° API. European consumption is marked by a large percentage of residual components and gasoline is less important. Eventually, the lighter constituents of Hassi Messaoud crude as well as the other Saharan oils may exceed demand.

The most promising discovery of 1960 is the Ohanet area approximately 110 miles northwest of the Edjele area. The discovery well was drilled by Compagnie d'Exploration Petroliere in the southeastern corner of the Timellouline concession.

CEP had completed more than 4 years of extensive geological surveys, geophysical surveys, and wildcat drilling without finding commercial production prior to the 101 Ohanet. The production tests at the discovery indicate that the Lower Devonian sandstone will flow 45.5° API oil at better than 1,000 bbl. per day.

The discovery has been offset 4 miles north-northwest by the 102 Ohanet; this well has confirmed production from the same zone at 1,600 bbl. per day. A third well is being drilled in the area by CREPS on the Takouazet permit some 11 miles southeast of the Ohanet oil well.

The Societe Nationale des Petroles d'Aquitaine tested better than 90 bbl. per hour from the first well drilled on the Hassi El Gassi refraction seismograph anomaly in January 1959. Later exploratory and development wells have proved that the discovery was fortunately located. Subsequent wells drilled on this concession and on the neighboring Erg El Agreb could have condemned the structure. Abandoned as dry are the GS-2, the AR-3, and the AR-4. The AR-1 followed the GS-1 discovery as a producer but the initial enthusiasm for the structure declined with the three following failures; the AR-2 location on the Erg El Agreb concession was the latest completion, and initial drillstem tests have indicated a commercial producer of over 2,000 bbl. per day. The tests have run over 350 bbl. per day.

Production is from a Cambrian sandstone at a depth of 10,500 ft. The feature is a faulted anticline that is as yet poorly defined by drilling. In all probability, Hassi El Gassi will prove to be a substantial oil field as more conservative stepout wells are scheduled. The dry holes that have been drilled to the east and west have been 6 to 7-mile stepouts from the original producer. The GS-1 and AR-2 are separated by slightly more than 26 miles in a north-south direction. If continuous production is established between these wells, this would prove to be a valuable addition to the Sahara.

Along the border separating Algeria from Libya, CREPS has been actively developing the multiple pay fields that have been found by both geology and geophysics. Less spectacular than other areas in North Africa and far less publicized, the Edjele area reserves are in the order of several billion barrels and appear to be conservatively estimated in the published figures.

The shallow production is found in the Carboniferous, Devonian, and Ordovician formations. The less prolific production per well is compensated by the low costs of drilling and completion. The opening of the pipeline from this area to the Tunisian port of La Skhirra in October releases the shut-in production at Tiguentourine and at Edjele proper.

Zarzaitine is the largest field developed by CREPS in the region. Production is found in six distinct zones in the Devonian and Carboniferous formations. The estimated recoverable reserves are 500,000,000 bbl. Tests in the Ordovician have not established any commercial production from the formation as of April 1960.

CREPS will rely primarily on Zarzaitine for the deliveries through the In Amenas-La Skhirra pipeline.

The field was discovered in 1958 as the result of a seismograph survey. The faulted anticline will be drilled for the two producing zones in the Devonian section during the early stages of the development.

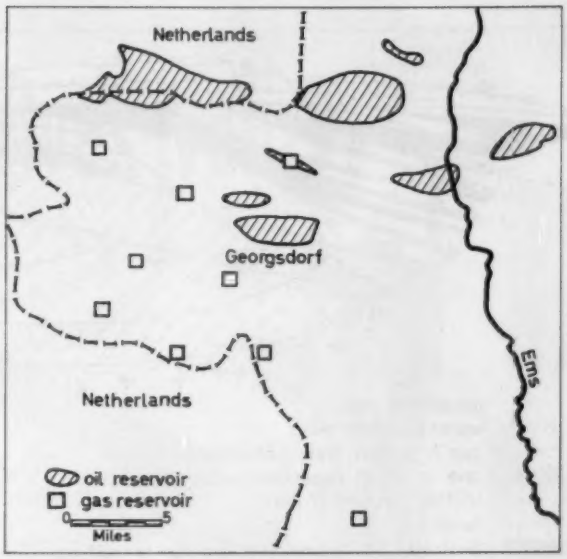
The first field to be found in the Sahara was Edjele field lying very close to the Libyan-Algerian border. The prospect was found by surface geological work. The discovery well was completed in 1956 and the field development has continued since then with over 88 shut-in completions in the Carboniferous and Devonian sandstones. The estimated recoverable reserves are 200,000,000 bbl. The production from Edjele will be about 25% of the total deliveries to La Skhirra by the pipeline.

Tiguentourine-La Reculee field was discovered in June 1956 from combined geology-geophysics. The estimated recoverable reserves are 150,000,000 bbl. from two zones in the Carboniferous and two zones in the Devonian. The operator has recovered wet gas in the Ordovician at 4,600 ft. The field will remain shut-in as development drilling continues to evaluate the area.

Thirty miles southwest of Tiguentourine, CREPS is developing El Adeb Larache field, a surface-geology prospect that was confirmed by seismic work. The oil is found in the sandstones of Devonian age at 4,100 ft. Initial production tests have confirmed potentials of 1,500 to 2,000 bbl. per day per well. The development program in the area is complicated by fine sand (fesh-fesh) on the surface that is an obstacle to well-site preparation and road building.

In addition to the four principal fields under development, CREPS has made significant discoveries of oil and wet gas at Collenia, Dome, Ikebrane, Ouan Taredjeli, Ouan Taredert, and Oued Zenani.

EMSLAND DISTRICT is site of Georgsdorf reservoir and other producing fields. Fig. 1.



GEORGSDORF FIELD is second largest in Germany. Germany's largest water-flood project will soon be started here. Fig. 2.

Georgsdorf Southern Flank: A long-term

Water-injection project in Emsland region

BY DIETRICH MARSAL
Gewerkschaft Elwerath,
Hannover, Germany

GERMANY'S biggest water-flooding project will soon be started on the southern flank of Georgsdorf reservoir, Emsland district, Germany.

This field, second largest in Germany (Figs. 1 and 2) was discovered in 1943. It is owned by four companies; Deilmann, Elwerath, Preubag, and Wintershall. High crude viscosity and extreme variance in permeability mean low recovery from primary production methods.

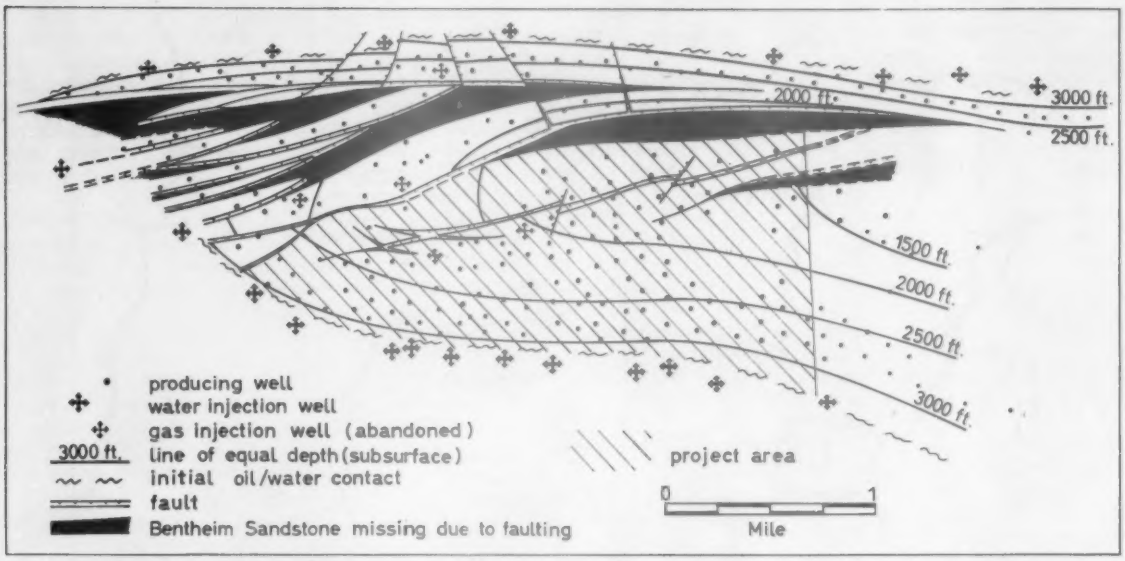
The oil-bearing horizon of the Georgsdorf concession is part of the Bentheim sandstone. Structure is anticlinal. Pay zone thickness averages 120 ft., and covers approximately 3,000 acres.

A complex fault system, running from east to west separates the south-

Some vital statistics on Georgsdorf reservoir

Date	Cum. production (million barrels)
Jan. 1, 1945	0.02
Jan. 1, 1947	0.20
Jan. 1, 1949	0.76
Jan. 1, 1951	3.33
Jan. 1, 1953	5.82
Jan. 1, 1955	8.79
Jan. 1, 1957	12.44
Jan. 1, 1959	16.80
Jan. 1, 1960	19.02

Reservoir characteristics.
Type: Undersaturated reservoir
Structure: Anticline
Main pay zone: Bentheim sandstone (Lower Cretaceous)
Other pay zones:
Wealden (yields less than 2% of total production)
Apt, Gildehauser sandstone (insignificant)
Geometrical proportions:
Average thickness: 120 ft.
Area: 3,000 acres
Dip: 55 . . . 70° (N); 30° (S)
Initial oil-water contact: 3,055 ft. (N); 3,170 ft. (S) datum level
Initial pressure: 1,396.5 psi. at 2,700 ft.
Temperature: 113° F. at 2,700-ft. datum level
Porosity: 22-25%
Permeability: 10-5,000 md., average: 250 md. (E); 1,270 (W)
Connate-water saturation: 23% (E); 12% (W)
PVT data:
Bubble-point pressure: 1,030 psi.
Formation volume factor at 1,030 psi.: 1.059 res. bbl./S.T.bbl.
Initial GOR: 140 cu. ft. per barrel
Viscosity: 128 cp. at 1,030 psi.
Wells:
Number: Bentheim sandstone: 245
Other pay zones: 28
273
Spacing: approx.: 650 ft.
Completions: In the early wells, liners were used for completion. Later on 6 5/8" casing was set and perforated. Slotted liners were used to control sand production.



COMPLEX FAULT SYSTEM separates southern part of the reservoir from northern part. Fig. 3.

ern part of the reservoir from the northern part, each with its own aquifer. It splits the isolated western flank into several small blocks (Figs. 3 and 4). Due to the gradual increase of clay content of the sand to the east, the permeability decreases from 2,000 md. to less than 100 md. Such low permeabilities are rarely found in German fields.

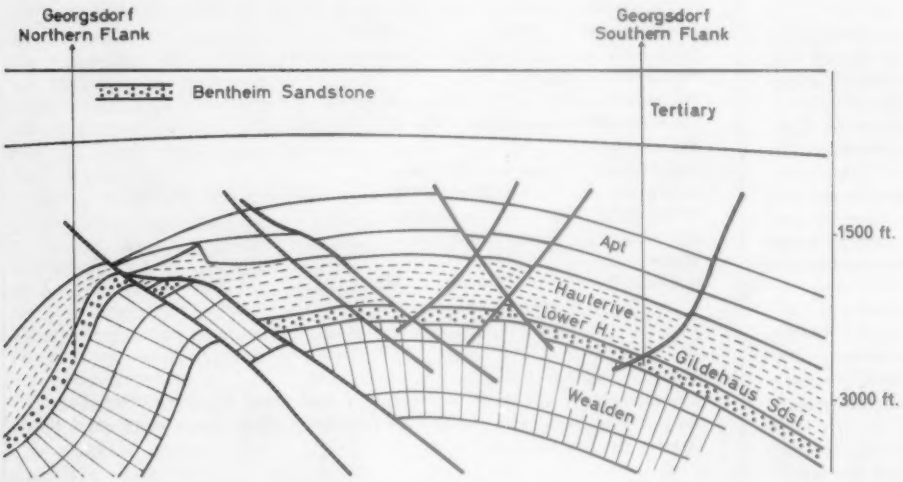
The southern flank. The southern flank is connected to an aquifer, which, so far has maintained almost constant pressure in the reservoir. This region of pressure influence is a relatively small strip of pay zone bounded by the initial oil-water contact in the south and a line of minimum reservoir pressure in the north. The latter, a so-called pressure valley, was created by production. On either side of it the pressure is increasing gradually until the highest values are reached at the initial edge-water contact in the south and the top of the formation in the north (Figs. 5 and 10).

All wells drilled north of the pressure valley produce at low rates, by solution gas drive. Due to the high oil-gas viscosity ratio this mechanism is expected to yield a small recovery. Gas injection was tried for a while to improve natural performance.

Those wells located south of the pressure valley produced approximately 40% of the total production by natural water drive, reinforced by water injection. A Hurst-Van Everdingen analysis showed that, if pressure was to be maintained above the bubble point, the natural water drive would result in rather low production rates in the future. On the other hand a large pressure drop would induce an unfavorable gas concentration. Consequently, the increase in water out of all wells near the initial oil-water contact and the attempt to maintain high reservoir presure resulted in a decrease of average oil production in those wells located near the region of effective natural water drive. The decrease amounted to one-half of the initial rate after a period of 7 years.

The decision to start a water-flood project came as a result of a study of these production problems. It was decided to begin injection on the flank of the structure.

The flank injection project. A theoretical study of this project was started in the summer of 1956. The results were compared to a pilot test in the area shown in Fig. 5. This test was continued for 2½ years. Results of this experiment satisfied the pre-



ISOLATED western flank of reservoir is split into several small blocks. Fig. 4.

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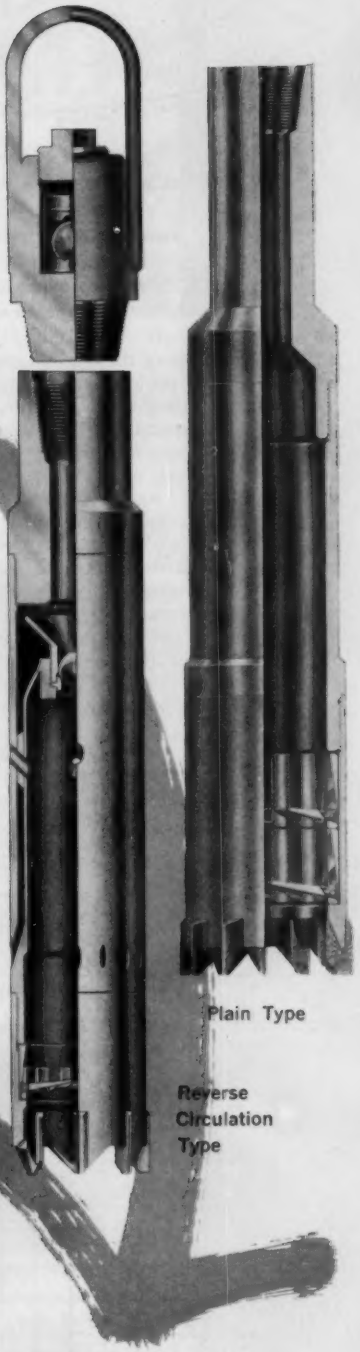

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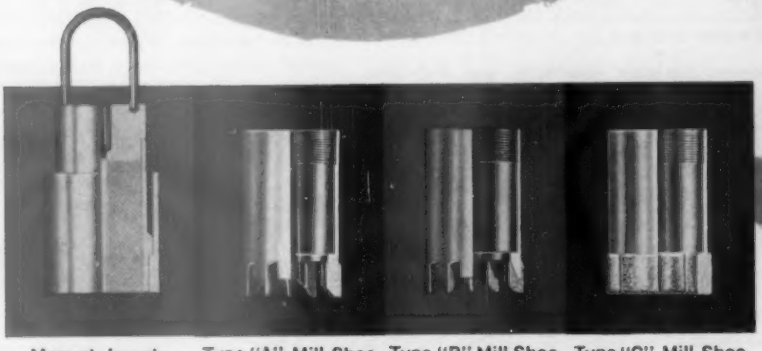

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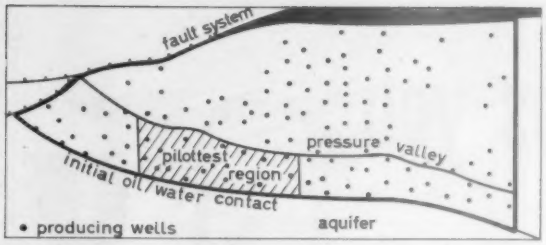
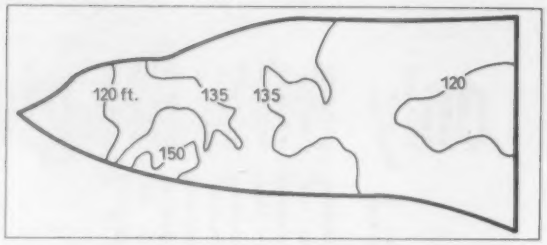
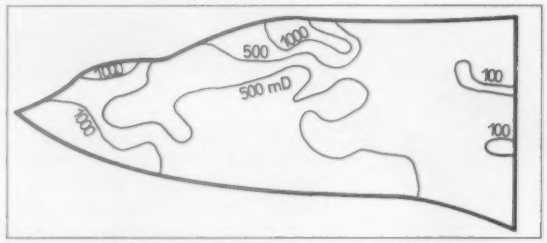


PILOT TEST has been made in the reservoir. Fig. 5.



PAY-ZONE THICKNESS varies from 120 to 150 ft. throughout the reservoir. Fig. 6.



MEAN PERMEABILITY varies from 100 to 1,000 md. Fig. 7.

dictions made with regard to production development, but also pointed out some weak points concerning the energy conception of the original plan. In 1959-60 the project was changed to suit energy conditions and future technical or production developments.

At first, the expected recovery as a function of the per cent water cut in producing wells was calculated by analyzing the production performance of various wells. The results were compared to the data obtained from flooding experiments on homogeneous cores. Satisfactory agreement was obtained. For all later calculations, preference was given to the field results for these reasons:

1. The advantage of having a large flooded volume instead of a small core sample.

2. Avoiding the uncertainty which might occur when transferring the results from homogeneous cores to inhomogeneous sands.

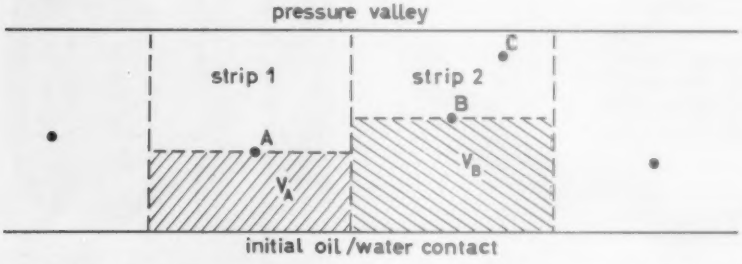
The laboratory experiments were carried out in the usual fashion. A rectangular drainage area containing the pore volume V was dedicated to each well, Fig. 8. If Q is the cumulative oil-plus-water production in the strip of pressure influence of the edge water (i.e. O_A in strip 1 and $Q_A + Q_B$ in strip 2 of Fig. 8), then the application of the linear equation gives

$$df_o/ds_o = V/Q$$

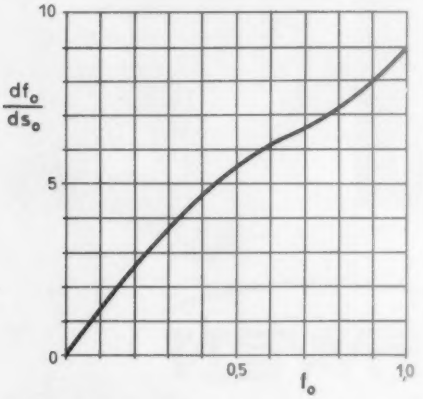
where: f_o = fractional flow of oil into well A or B; s_o = average oil saturation in the vicinity of well A or B.

Actually, this expression is not identical with df_o/ds_o function obtained on homogeneous cores, but is in a certain sense the weighted average of all df_o/ds_o curves belonging to the different permeabilities of the pay zone.

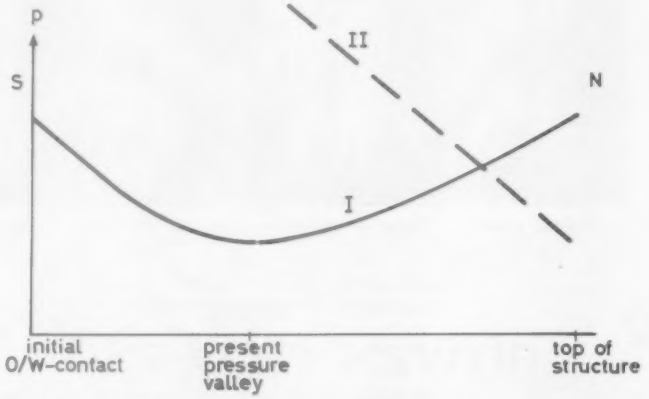
With increasing water cut the horizontal sweep efficiency will increase and the system will tend to change to



RECTANGULAR DRAINAGE AREA containing the pore volume, V, was dedicated to each well. Fig. 8.



AVERAGE CURVE for df_o/ds_o was drawn after well analyses. Fig. 9.



RESERVOIR PRESSURE must be raised considerably above aquifer pressure if all wells are to be produced by means of flank injection drive. Case I is present pressure distribution. Case II, project region under influence of water drive. Ordinate, p, is shut-in pressure. Fig. 10.

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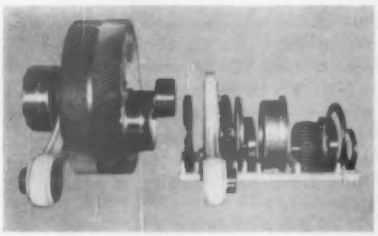

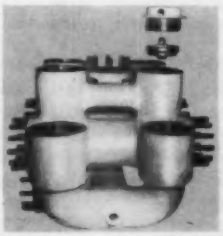

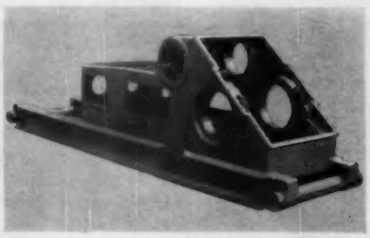

Top quality components such as Timken bearings and Falk herringbone gears assure longer, trouble-free performance. Streamlined, one-piece cast steel fluid ends are designed for highest volumetric efficiency and tested to twice rated operating pressures. Fabriform frames are stronger and lighter in weight.

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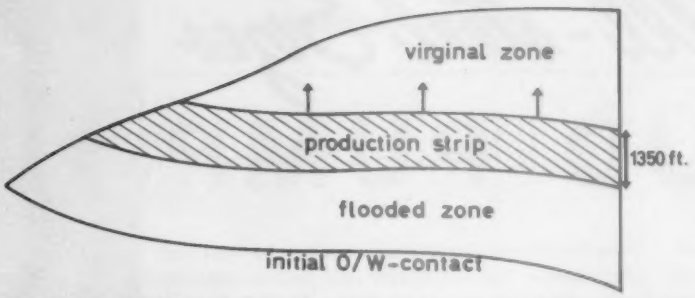


MAIN PRODUCTION will be restricted to wells in a strip of constant width which is shifted slowly toward the top of the structure. Fig. 11.

a pattern of linear flow. It is expected that the accuracy of the results obtained by this method will increase with increasing water-oil ratio.

Three wells not previously influenced by gas injection were analyzed with the same equations. This resulted in similar df_o/ds_o vs. f_o curves from which an average curve was drawn, Fig. 9. Numerical integration yielded a curve of f_o vs. s_o from which the dependancy of per cent recovery on water-oil-ratio was derived. This method still needs verification because:

1. It is assumed that a simple model will closely approximate a complex 3-dimensional system.

2. It was found that laboratory flood velocities were much lower than those desired for the project. Consequently, applications can only be made if ultimate recovery is independent of production rates within certain limits.

3. The maximum water-oil-ratio of the analyzed wells was just above 1.0, and the trend of the df_o/ds_o curve had to be extrapolated to higher values.

Thus it was necessary to confirm the predicted relation between oil production and water cut by means of a pilot test. The production rate of the area as shaded in Fig. 5 was raised and the water cut observed, with these results:

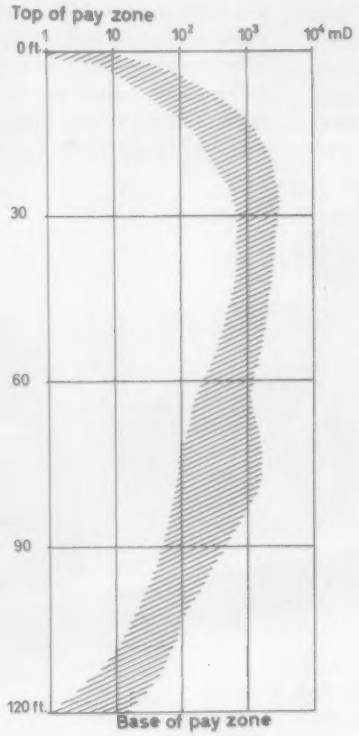
Data	Deviation (%)
Jan. 1957	+13.8
July 1957	+12.7
Jan. 1958	+13.4
July 1958	+13.1
Jan. 1959	+13.2
July 1959	+12.9

A look at these data shows that the df_o/ds_o curve obtained by the water-oil ratio development of the three wells tested does not predict the exact breakthrough in the pilot region. In fact the flood front reached the wells later than was theoretically calculated.

On the whole the pilot test shows:

1. The Buckley-Leverett theory proved to be reliable for a water invaded area comprising 5.3% of the total project volume.

2. The theoretical results are based



PERMEABILITY varies irregularly with depth, based on measurements in 66 wells. Fig. 12.

on an analysis of the production performance of wells having a water cut not exceeding 60%. Today the water cut has increased to more than 90%. Thus, the accuracy in predicting cumulative oil production at high water-oil ratio was satisfactory.

3. Within the range of the predetermined production rates the degree of depletion was independent of the flood velocities.

4. If all wells in the project area are to be produced by means of flank injection drive, the reservoir pressure will have to be raised considerably above the aquifer pressure, Figs. 10 and 11. Then a high percentage of the injected water would flow into the aquifer.

To avoid the disadvantages of item 4, the production will mainly be restricted to the wells located in a strip of constant width which is shifted slowly towards the top of the structure, Fig. 11. As soon as the first row of wells has reached uneconomical water cut and the wells are shut in, the production rate of the row just north of the present pressure valley will be raised to the high rate of those wells already belonging to the strip. In this case it is only necessary to inject an amount of water equivalent to the total production. The injection rate proposed would be 6,300,000 bbl. per year.

Thus at any time the whole project area will be divided into two parts; an invaded area with high production and an uninvaded area in which production is low.

In addition to those already mentioned, this production process has several advantages:

1. If it should be desired at any time to abandon this program in order to replace it by a more successful one not yet known or not yet completely developed for field application, this could easily be done. There will not be any unfavorable effects of the present procedure on the uninvaded parts of the project area.

2. The oil-production rates as well as the water-oil ratios will be practically constant throughout the entire program. Peaks in water production with all its technical and financial disadvantages will be avoided.

3. Since the flood front will reach the top of the formation at a relatively retarded time, the accuracy of prediction will not be affected by our still inaccurate knowledge of many important physical reservoir conditions.

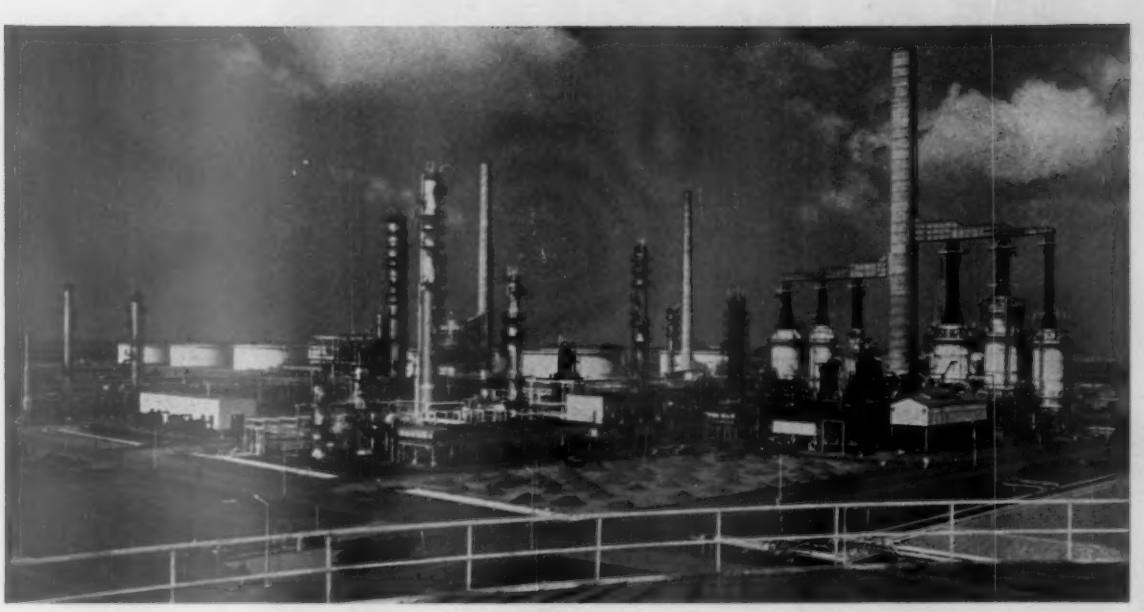
4. Impermeable faults parallel to the initial edge-water contact may be easily "jumped" by drilling injection wells to the north of the fault.

This article does not take into consideration the various technical problems connected to the project. However, one item of general interest may be mentioned. Unexpectedly the injection pressure required was found to be about 10 to 100 times larger than that resulting from the calculation based on Darcy's law.

One of the reasons for this discrepancy might be that only a few selective parts of the bore-hole surface are open to flow.

Acknowledgment

The author is indebted to the managements of C. Deilmann, Bergbau G.m.b.H., Gewerkschaft Elwerath, Preubische Bergwerks-und Hutten A.G. and Wintershall A.G., and Dr. Roll, director of Gewerkschaft Elwerath, for permission to publish this article.



LAND RECLAIMED FROM THE SEA is the site of Esso Nederland's 100,000-bbl. refinery near Rotterdam.

Esso's new Rotterdam

Refinery is completely air cooled

$50,000,000 plant is one of the most modern on the continent

BY D. H. STORMONT
Refining Editor

WHEN Esso Nederland, N.V., decided to build a refinery in the Rotterdam area, one site was particularly desirable because of its nearness to both inland waterways and the North Sea.

This was a tract of farmland being developed by the Rotterdam Harbor Authority. Like much Dutch countryside, this was below sea level and not suitable for industrial use. So the Harbor Authority started the dredges in motion and today, after 10,000,000 cu. yd. of sand and silt has been pumped from the Maas, the 480-acre site is some 15 feet above sea level. The surface stabilized after an initial settling of about 1 ft.

The 100,000-bbl. refinery, built at a cost of $50,000,000, has been in operation since early this year. Crude is largely tankered in from the Middle East. About 20,000 bbl. daily is obtained from Netherlands oil fields, mostly by pipeline and tank car.

Processing facilities consist of a 100,000-bbl. crude unit, a 16,500-bbl. cyclic Powerformer, and a 16,500-bbl. gas-oil Hydrofiner. Copper chloride treating facilities were provided for lighter products.

Designed to supply the Netherlands and nearby markets, the plant produces about 15% gasoline. Other products include jet fuels, heating oils, diesel fuels, several grades of industrial fuel oils. Products are ship-industrial fuel oils. Products are shipped by pipeline, barge, rail, truck, and tanker.

Since bulk of the plant's crude supplies are received by tanker from the Middle East, about 2,000,000 bbl. of crude storage is provided. This capacity, provided in 13 floating-roof tanks, enables a uniform charge to be fed to the single-stage crude unit.

Modern features provided. The plant is one of the most modern on the continent, and is the largest in Europe that is completely air cooled and electronically controlled. The 500-M.M.B.t.u. per hour furnace for the crude unit also is the largest in Europe. Highlights of the plant's many features are:

... **A central control room.** Controls for the crude unit, catalytic reformer, and hydrodesulfurization unit are all grouped in one building. Except for loading and unloading operations, which are conducted elsewhere, all operations can be supervised and regulated from main control room.

... **Electronic controls** are used throughout. Only air used is that for valve operation.

... **Remote tank gaging** and temperature measurement. Readings are indicated and recorded (in the main control room) on the crude tanks and on most intermediate and product storage tanks.

... **In-line blending** is widely used, principally into product tanks.

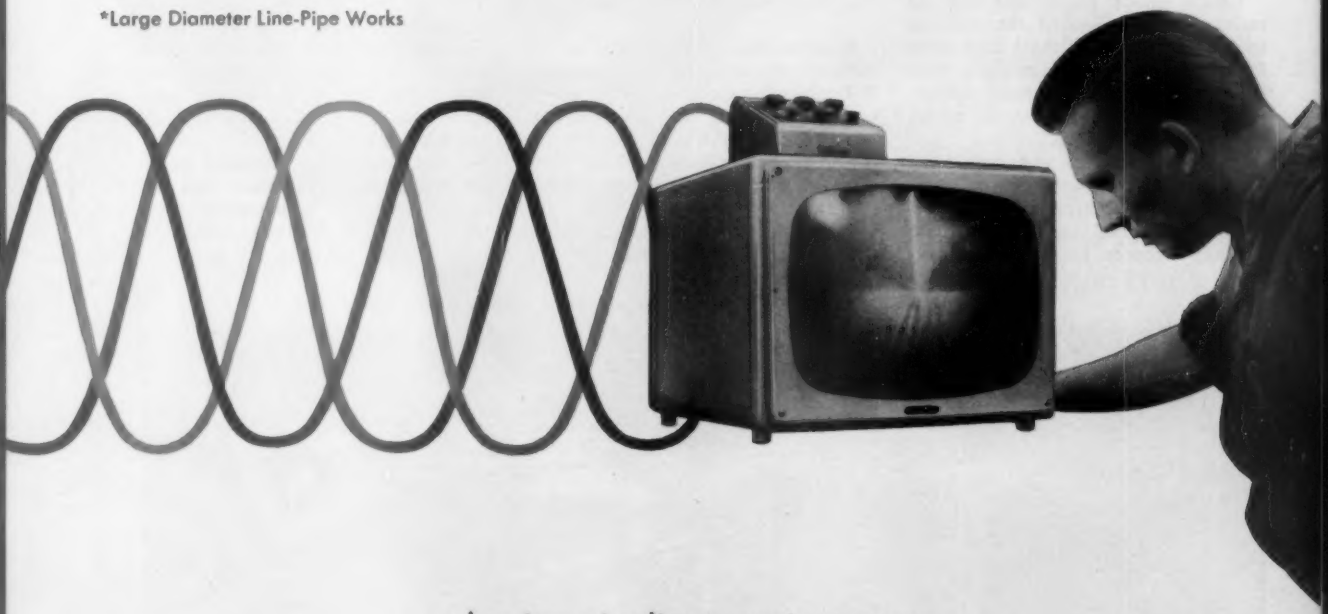
... **Motor-driven pumps** are used except in services where a power failure would be critical. Steam-driven turbines are used for tower bottoms and reflux pumps, and for such services as instrument air and the fire water system.

... **Air cooling** is used throughout the refinery except for jacket water cooling on compressors. Batteries of air-fin cooling units, equipped with

A private eye inside a line-pipe

This private eye at Großrohrwerk Mannesmann-Hoesch* is an electronic one and therefore able to watch every inch of the seam continuously from the inside during longitudinal welding. Control by TV is the most efficient way to ensure that you shall not have to dig up any section of your new Mannesmann-Hoesch pipelines. However, it is not the only way of testing; ultrasonic, magnetic, and X-ray methods are also available.
A whole team of experts also constantly watches every production process. Production of all Mannesmann-Hoesch line-pipes, from 6 5/8" to 42", is so thoroughly automated at all stages that human error is practically eliminated.

*Large Diameter Line-Pipe Works



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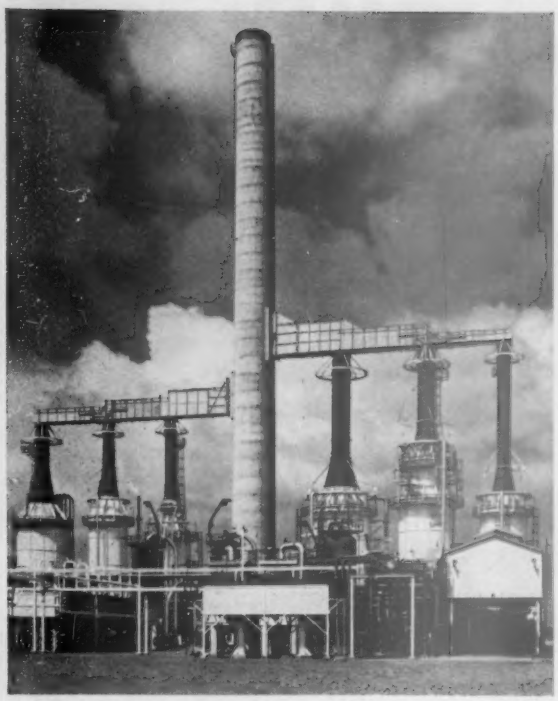

SECONDARY PROCESSING consists primarily of this 16,500-bbl. cat reformer and adjacent gas-oil hydrodesulfurization unit.

ALL CRUDE DISTILLATION is carried out in this single unit, the largest in Europe. The plant produces about 15% gasoline and full line of intermediates.

variable-pitch fans, perform all functions usually done by cooling water.

Lower initial cost and reduced maintenance influenced the decision to use air cooling but there were other factors too. Its use eliminates need for a large sewage-disposal system, and lessens the possibility of public waters being polluted.

Air pollution also was considered in the plant's design. Sulfur compounds stripped from various products are burned in the high temperature furnaces. The extra-tall stacks used, ranging from 250 to 300 ft. high, assure the waste gases will be dissipated into the atmosphere.

Construction. Basic design of the refinery was done by Esso Research & Engineering Co., which also supervised engineering and construction. Prime contractor for engineering and construction was Badger, N.V., Netherlands subsidiary of Badger Manufacturing Co.

Initial construction was started in the spring of 1958, while fill was still being pumped into the site. When the latter operation was completed in the summer of that year, the job of pile driving was started. Over 2,000 concrete piles were driven to solid ground, some 80 ft. below the surface. With the exception of tankage, piles were driven for buildings and all major structures.

Piping, except for high-alloy steels, was fabricated in the plant yard. To accomplish this, a complete pipe-fabrication shop, including automatic welding machines, was set up.

UNLOADING CRUDE at one of two marine terminals built at plant site.

ANY KIND OF PIPE FOR THE OIL INDUSTRY

SEAMLESS AND WELDED LINE PIPE TO API 5L AND 5 LX. Seamless from 1/8" up to 16" OD incl. Butt welded from 1/4" up to 3" OD incl. ERW from 1/4" up to 16" OD incl. Cold expanded from 20" up to 40" OD incl. OIL COUNTRY TUBULAR GOODS IN ALL API GRADES INTEGRAL JOINTS OF CASING (Spang extreme line, Buttress, Lacq) AND TUBING (Lacq T1 and T2) SPECIAL SOUR GAS CORROSION RESISTANT TUBING

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Charioteers learned 34 centuries ago that lubrication made things work easier, last longer.

Ancient Chinese invented a simple, rugged, efficient plug cock.

Blaise Pascal formulated principles of hydraulics in the 17th Century.

the idea:

The Perfect Application Of A Principle

Sven Nordstrom ingeniously applied Pascal's principles of hydraulics and created the first lubricated plug valve in 1916 . . . the world's first valve that shut-off positively without the uncertainty of wedging metal into metal.

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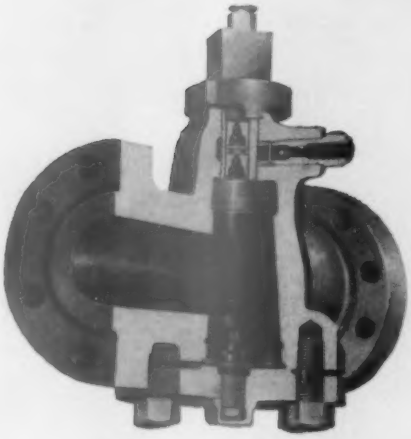

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Instant 1/4-Turn Operation . . . Positive Shut-off . . . Longer Life At Lower Cost . . . Easy Operation . . . No Exposed Seats . . . Instantly Replaceable Seal

The 6 million Rockwell-Nordstrom lubricated plug valves now used in a wide variety of industries are translating these benefits into dollars and cents savings day after day. Rockwell-Nordstrom is the most complete line of lubricated plug valves (sizes from ½" to 36"; pressures to 15,000 lb), lubricants and operating accessories. For *practical* help in solving your flow control problems, see your supplier or write: Rockwell Manufacturing Company, Dept. 92-K, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited. If you live outside the U. S. or Canada, write: Rockwell International, S. A., Geneva, Switzerland.

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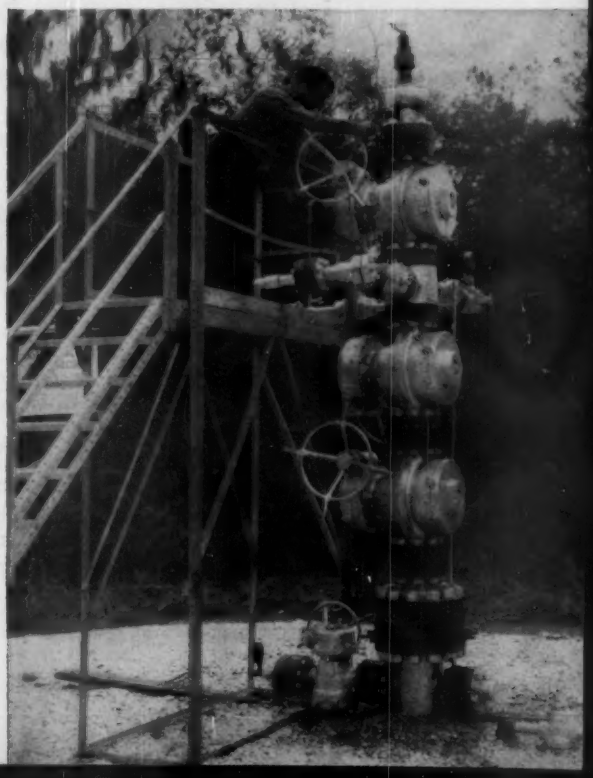


WEEKLY DC3 FLIGHT arrives at a typical isolated rig camp in Libyan desert. Plane brings perishable food and emergency lightweight supplies. In addition, rig personnel are flown out to Tripoli or Benghazi for week's leave each month. Radio brings plane quickly in emergencies.

How Oasis conquered the desert

Because of its vast operations in an important new oil province, the name of Oasis Oil Co. of Libya has become well known and respected not only in Libya but throughout the world. Here, the man who guided Oasis Oil through its infancy and saw it overcome tremendous obstacles to make five important oil discoveries, tells how it was done.

BY ROBERT E. McMILLEN

. . . executive vice president of Oasis Oil Co. of Libya, Inc. He joined Ohio Oil Co. in 1941, and after a series of moves, he became manager of the Sidney, Neb., production district in 1954. McMillen was made resident manager of Oasis in 1959. He moved into his present job earlier this year. McMillen is a petroleum - engineering graduate of University of Pittsburgh.

THE CONORADA GROUP of companies consists of Amerada Petroleum Corp., Continental Oil Co., and Ohio Oil Co. through their respective subsidiaries, Amerada Petroleum Corp. of Libya, Continental Oil Co. of Libya, and Ohio Oil International of Libya (formerly Oasis Oil Co. of Libya).

Concessions were first granted to the three Libyan subsidiaries in December 1954 and others were granted later. The group now has 12 concessions rather evenly distributed across Libya from the Algerian to the Egyptian borders. Total area covered by these 12 concessions is some 62 million acres.

Following usual practice after preliminary reconnaissance geology had been conducted by the Conorada group, one member company was selected to explore the concession areas. In this instance, Ohio Oil Co. through its subsidiary, Oasis Oil Co. of Libya, was selected to be the operator for the group during early operations.

Now, operations have passed the exploratory stage and development is beginning in Dahra field in Concession 32. So, a new company, Oasis Oil Co. of Libya, Inc., owned jointly by the three parent companies, has been formed to conduct future activities in the country.

Exploration

Oasis' first oil discovery was made in July 1958 at the first well drilled by the company in Libya. This well, the 1 Bahi in Concession 32, cut saturated oil sand at the shallow depth of 5,800 ft. The well would not flow

PORTABLE RIG at work in Libya. When rig moves from one location to next, it must travel caravan style under watchful eye of airplane.

OASIS CONCESSIONS are the shaded areas marked with concession numbers. There have been three oil discoveries in Concession 32, another each in Concessions 26 and 59.

but swabbing tests showed it capable of pumping 500 bbl. per day of 40°-gravity sweet oil.

Drilling in the Bahi area has since been disappointing. Four stepout wells have been drilled and all were dry.

Oasis' second oil discovery was made in October 1958 on its second Libyan venture at 1 Dahra. This well is also in Concession 32, 25 miles south of 1 Bahi. Although it would not flow from a saturated-lime formation at 3,800 ft. (later termed the PL-7 zone), the well had a high pumping potential. This oil was also sweet and had a gravity of 36° API.

A third sweet-oil discovery in Concession 32 was made in March 1959 at F1-32 at a still-shallower depth of 3,200 ft. in the PL-5 zone. This well is 8 miles southeast of 1 Dahra, and was Oasis' first flowing well in Libya. Oil tested 42° API gravity.

Later drilling around 1 Dahra and F1-32 proved both reservoirs are large. Wells in the PL-5 zone have been completed with flowing potentials as high as 11,500 bbl. of oil per day. Development drilling is now in progress with four rigs running in Dahra field.

Early in 1959 Oasis began expanding its exploratory operations from a level of 3 drilling rigs and 4 seismic crews to 12 rigs and 11 seismic crews. This accelerated program has resulted in completion of 45 wells to August 1, 1960. A total of 15 oil wells, 3 gas wells, and 27 dry holes have been drilled.

In addition to the three oil discoveries mentioned above in Concession 32, oil was discovered at A1-26 in Concession 26 which borders on Algeria and Tunisia, and at B1-59 in Concession 59 in the Sirte Gulf area. Stepout drilling in both these areas is now under way.

Deepest hole yet cut by any operator in Libya was at Oasis B1 in Concession 33 on the Egyptian border. This well was abandoned after drilling to 13,672 ft. with no shows of oil or gas.

There are eight mine-clearance parties in the field. They clear lanes through World War II mine fields ahead of seismograph parties and on access roads and drilling locations. This aftermath of the war continues to plague Libyan operations and will always be something to reckon with in the uncharted desert.

Plan pipeline, terminal. The Oasis group along with two other oil companies who jointly hold Concession 17 (bordering Concession 32 on the west) are planning to build a 30-in. pipeline to the Gulf of Sirte some 85 miles to the north. Construction is expected to begin before the end of the year. Exploratory drilling in Concession 17 has also discovered oil production, making feasible a joint pipeline and marine terminal by owners of these adjacent concessions.

Locating wells. Only a small part of Libya has been surveyed along the coast where the majority of the population lives. Oil companies have surveyed much of Libya since 1954 and aerial photos are now available covering most of the country. Concession boundaries are defined from these controlled photo mosaics. Seismic lines and surface-geology control points have been carried into the desert from previously established control, or have been established from the stars.

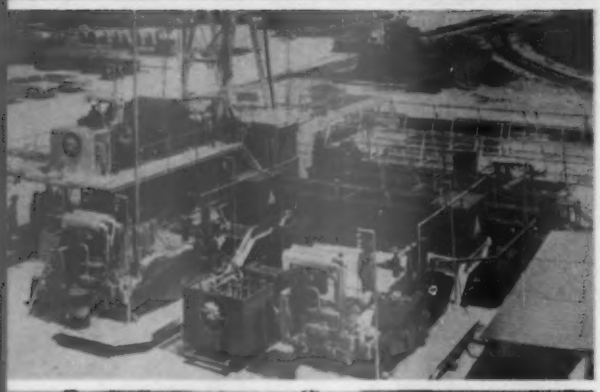
A great number of astral fixes have been made by Oasis surveyors throughout its concessions. Most of the drilling locations have been surveyed from seismic control lines and then astral fixed. As soon as this has been done, mine-clearance crews clear the location and lay out and prepare landing

CONTINENTAL-EMSCO'S TURNKEY SERVICE SOLVED THE PROBLEMS OF READYING . . . THIS SPANISH SAHARA RIG

Falcon-Seaboard Drilling Company found a fast, economical way to eliminate the headaches of preparing the first Spanish Sahara drilling rig. They placed the responsibility for design, supply, assembly and packaging with one source — Continental-Emsco's Houston plant. Here, at the world's largest and most complete oil field equipment facility, the entire rig and camp — complete to eating utensils — were readied for service in just 45 days.

When the rig was shipped, Falcon-Seaboard knew it was *right*, thanks to Continental-Emsco's unusual plantsite-integration of engineering, manufacturing and quality control. Delays were eliminated and modifications expedited at minimum expense because every step through final testing was centered at a single location. Result . . . a complete package of reliable Continental-Emsco drilling equipment, engineered to work in harmony for maximum performance.

Check the facing page. See how you, like Falcon-Seaboard, will profit from Continental-Emsco's complete turnkey service. Whether you're rigging up for overseas or domestic drilling . . . standard or specialized rig . . . be certain you talk *first* with Continental-Emsco.



FROM DRAWING BOARD TO DOCKSIDE

RUGGED PORTABILITY of Continental-Emsco's T-97-250T Dual Trailer Drilling Rig answers the transportation problems posed by Spanish Sahara's barren wastes. Mast travels with rotary table in place and traveling block completely strung, ready for assembly with drawworks trailer. Time and expense of rigging up, tearing down and transporting are cut to a minimum.

SPECIAL PROBLEMS are quickly and efficiently solved at Continental-Emsco. Typical result is this "trailerized" slush pump, furnished for Falcon-Seaboard and now offered as standard equipment. In operation, trailer frame rests firmly on the ground, supporting engine and pump at a low level to assure flooded suction. It backs into position without jack-knifing the trailer. Tool houses, fuel and water tanks and complete mud system were designed and built by Continental-Emsco.

MONEY-SAVING ASSURANCE that rig is ready for service . . . that's Continental-Emsco's pre-overseas assembly. Every component is inspected, installed and tested. All piping is fitted at the plant. Any desired modifications are quickly, inexpensively handled. No costly delays occur when rig reaches a remote drilling area.

QUICK SHIPMENT to overseas destination is aided by Continental-Emsco's accessibility to Port of Houston. Complete packaging at the factory provides the best protection for materials en route. Special expediting team follows through on orders to speed delivery. Wherever you choose to operate, Continental-Emsco's big, capable, worldwide service organization adds *extra value* to your purchasing dollar.

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LIBYAN FLOOR MEN, usually five for each crew, learn rapidly and in time become proficient. American or European derrick man supervises difficult or unusual jobs while driller must stay at the brake.

strips for aircraft. Normally two cross strips are prepared in order that DC3 aircraft can land without difficulty from wind direction.

Logistics biggest problem. An overall program of the size being conducted by Oasis introduces many problems, the greatest being that of logistics. Both supply and transportation are difficult in a country which has very few highways and which produces few commercial products consumed by the oil industry. The only paved highway of any consequence in Libya is one along the Mediterranean Coast, extending from the Algerian to the Egyptian borders.

Water supply. Both drilling and potable water supplies are a problem in the desert. With the exception of the extreme southern end of Concession 32, water has been found at all Oasis drilling locations within a short distance of the well sites.

Oasis operates three spudders and portable drilling rig to develop water supply. Normally, a water-well rig is put on location sufficiently in advance of the drilling rig that at least two good water wells can be developed prior to the rig move.

Adequate water supplies have been developed in all concessions at depths above 800 ft. With the exception of a small area in Concession 26, none of the water has been found to be directly potable without treatment. The water varies in salinity and hardness with total solids varying from a low of 800 p.p.m. to a high of 10,000 p.p.m. Recent deep wells seeking drilling water in the south end of Concession 32 yielded sulfur water containing as high as 27,000 p.p.m. total solids.

Therefore, potable water must be hauled long distances to supply drilling crews from the closest fresh-water supply. In some cases this distance exceeds 400 miles. Result is very expensive fresh water with costs ranging from $3.00 to $7.00 for a 42-gal. barrel.

A small dialysis water-conversion unit is being used to supply potable water to one of the rigs. In addition, a large dialysis unit has been installed in Dahra field in Concession 32; this unit should supply potable water to all rigs and production crews working in this area. It is still uncertain how satisfactory the dialysis units will be since they have been in operation only a short time. There have been some troubles but these should be overcome and good potable water become available at reasonable cost.

All drinking water is treated with chlorine before use by the rig crew.

Drilling Practice

The 12 rigs operating for Oasis in Libya belong to 4 drilling contractors. Present rig program includes one National 110, three National 100's, two National 80B's, two National 55's, one National T-45, one National T-32, one Ideco 525 "Desert Star," and one Ideco H-30. Both the National T-45 and Ideco 525 have been unitized and trailer-mounted to reduce the number of truck loads on rig moves.

Each drilling rig has two contract tool pushers. In addition, Oasis attempts to keep a company tool pusher in contact with these rigs at all times. Development drilling in Concession 32 can be supervised by one company tool pusher looking after two or three rigs.

A typical drilling crew includes an American driller, an American or European derrick man, and five Libyan floor men. Although rig work is still quite new to most of the Libyan crewmen, they are learning rapidly and in time will become proficient. An American or European derrick man is necessary at present to supervise the floor men in more difficult and unusual tasks that must be done while the driller is at the brake.

Each rig has its own camp which to house the 12 to 15 expatriates and 40 to 50 nationals who are on the location at all times. These camps are as modern as possible and contain recreation, dining, and medical facilities. A doctor and a hospital trailer stay at each of the wildcat-drilling sites. The food is the best available in Libya and is usually provided by catering companies contracting this service.

Hole, casing programs. The following hole-size and casing programs are used on all wildcat wells:

15-in. hole opened to 24½-in. for 20-in. conductor pipe.

12¼-in. hole reamed to 17½-in. for 13⅜-in. surface casing.

8½ or 9⅝-in. hole reamed to 12¼-in. for 9⅝-in. casing if necessary.

9⅝-in. hole for 7-in. casing if necessary.

8½-in. hole for 5½-in. production casing.

The intermediate strings of 9⅝ and 7-in. are for deep holes and shutting off lost-circulation zones. To date, only three intermediate strings have been run to stop lost circulation.

In development wells of Concession 32, hole size and casing program is as follows:

15-in. hole for 10¾-in. surface casing.

9⅝-in. hole for 7-in. production casing.

Total depth of development wells is approximately 3,800 ft.

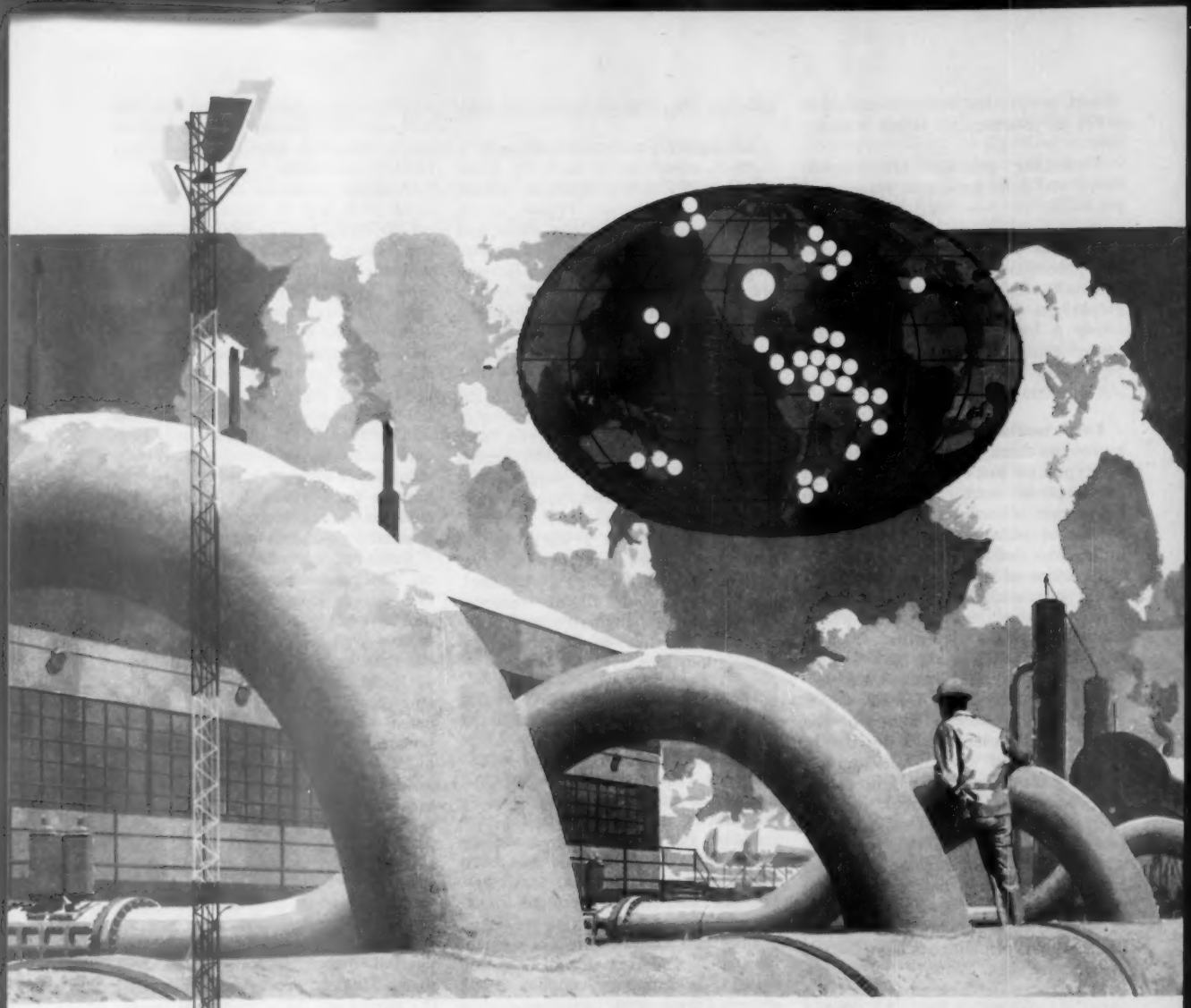
In the semiwildcat drilling in Concession 59, hole size and casing program is:

12¼-in. hole reamed to 17½-in. for 13⅜-in. surface casing.

9⅝-in. hole reamed to 12½-in. for 9⅝-in. intermediate casing if necessary.

9⅝-in. hole for 7-in. production string.

8½-in. hole will be drilled for the



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5½-in. production string in the event a 9⅝-in. intermediate string is necessary.

Cementing practices are conventional and there have been no unusual problems.

Blowout prevention. Double blowout preventers are used on all rigs. Normally this includes an emergency diaphragm-type preventer mounted above a hydraulically operated preventer equipped with both blind and pipe rams. There have been no blowout problems as yet.

Lost circulation. Lost circulation is a problem throughout Libya. Although all types of lost-circulation material are kept in stock, almost all lost-circulation zones have been controlled by use of redwood bark, cotton-seed hulls, fine and large mica.

In some of the worst loss zones, it has been necessary to set a successive series of neat cement plugs. Cement plugs are used rather than attempting control by the use of lost-circulation material because water supply is normally short. Usually 2,000 bbl. of drilling water is stored on the rig site. This volume does not permit excessive use of water while attempting to control lost-circulation zones.

Several times, lost circulation has been so bad that cement sacks, gunny sacks, etc., have been pumped away without any visible effect of the loss. In these extremely bad cases, intermediate casing has been set after dry drilling far enough below the loss zone to insure that cement rises high enough around the shoe joints of the casing.

Standard water-base mud has been used throughout Libya. In Dahra field, an oil-emulsion mud containing 12% oil has been used to reduce water loss and help eliminate tight-hole conditions. All types of mud materials are kept in stock so that nearly any kind of drilling mud can be mixed to take care of special conditions that may arise.

Fishing tools. An adequate supply of fishing tools, washover shoes, etc., is maintained to handle all routine fishing and most of the unusual fishing jobs that might occur.

Supply and Communication

Diesel fuel is used on all 12 rigs. It must be trucked from either Benghazi or Tripoli at extremely high cost. Tests are now being made in Dahra field using produced crude oil as fuel for drilling in order to cut costs. Crude, after being weathered to lower its flash point, is filtered to remove any solids that might be present.

If this field testing is satisfactory, all development drilling at Dahra will use the filtered crude for fuel.

Air supply. Once each week a DC3 flight is scheduled to each rig. Most of these flights are made by planes chartered locally in Tripoli or in Benghazi. However, Oasis owns and operates two DC3's and two Beaver single-engine planes. The two Beavers are used primarily for special service to carry either a small group or a small load.

One Beaver is stationed in Dahra field for emergency service.

Main purposes of the weekly flight are to supply the rigs with perishable food and to transport rig crews from Tripoli and Benghazi to the desert. Emergency lightweight supplies are also flown from the two supply centers to the field. Normal desert duty for drilling personnel is 3 weeks in the desert and 1 week in the city on leave.

In addition to regular rig personnel, the weekly supply flights transport Oasis geologists, engineers, tool pushers, and the like to and from the drilling locations.

Overland supply. Majority of rig supplies are transported overland by truck from Tripoli and Benghazi supply points. The main point of supply has been Tripoli since it has the only deep-water and all-weather port along the Libyan coast. Benghazi has port facilities, but it is limited to shallow draft-ships. Some material has been transshipped at Tripoli to small vessels for ultimate delivery to Benghazi.

Contracts have been let for deepening Benghazi Harbor. It will then ease shipping oil company supplies to the eastern Libyan area.

Radio communications. In order to keep 12 widely scattered drilling rigs running full time, it is necessary to have good coordination among drilling department, geological department, materials and transportation department, aviation department and all others concerned with operation of camps and drilling rigs. This necessary coordination is possible only through a good communications system.

Oasis has installed its own radio network to communicate from Tripoli and Benghazi to desert locations. This network is operated and maintained by Oasis personnel on a 24-hour basis. The radio is single-sideband suppressed-carrier equipment operating on frequencies ranging from about 3 to 9.5 megacycles.

Transmitter-receiver units are crystal controlled and operate on four channels. The transmitters are rated at 100-watt output. Since efficiency of single-sideband (SSB) type equipment is eight times that of ordinary amplitude-modulated equipment, the 100-watt SSB transmitters are equivalent to 800-watt amplitude modulated (AM) transmitters.

Antenna masts at the rigs range from 30-ft. high at the rigs near Tripoli, to 70 ft. high at the most distant rigs. These masts are usually moved with the rig from one well site to another by the drilling crews at the rigs. The communications people make routine maintenance checks and transmitter retuning checks at every rig move if possible.

Many of the Land Rover vehicles are also equipped with 30-watt SSB mobile radio units. These units help coordinate and supervise convoy movements during rig moves, assist in hunting for lost vehicles, and provide communications from work locations to nearby rig-site stations.

Safety of the men depends greatly on this communication system. Several times, injured men have been moved quickly and successfully from remote well locations to hospitals in Benghazi or Tripoli. The aviation department, when notified of such an emergency, has never failed to dispatch a plane immediately. Several such long flights have terminated in night landings at desert airstrips in order to bring severely injured or sick men into town where treatment and facilities are more complete.

Materials. No independent supply stores have been set up in Libya. So, Oasis must warehouse every item consumed in its operations. This includes such small items as spare parts for internal-combustion engines. More than 10,000 different items are carried in stock in three principal warehouses.

The No. 1 warehouse and pipe storage yard, located in Tripoli since nearly all supplies are unloaded at the port, covers 15 acres. The warehouse area, which is built primarily from prefab steel buildings, has some 21,000 sq. ft.

Because of the emphasis on development of Dahra field in Concession 32, a large warehouse and pipe-storage yard has been built there. With this warehouse now functioning, it is possible to transport direct to the desert some of the material without handling through the Tripoli warehouse. Dahra-field warehouse supplies a portion of the needs of the concessions within a 200-mile radius of Concession 32.

The third warehouse is at Benghazi. It supplies all rigs operating in Cyrenaica.

In order to keep the rigs supplied and to prevent shutdowns while waiting on materials, it is necessary to anticipate material requirements long in

"The rig is moved in two main convoys. Convoys are used so that if a truck breaks down, there will be help available. Convoys also reduce the danger and lost time caused when trucks become lost in the desert."

advance of need. Typical supply time from the United States is 9 to 12 days by air freight and 5 to 6 weeks normal sea delivery. Trucking time from Tripoli and Benghazi to drilling sites can be as long as 7 days and as little as 2 days depending upon location. Average supply time to Concession 32 is 3 days from time the order is made to the Tripoli warehouse until the material is delivered on the site.

No rig operating for Oasis has ever been shut down because of waiting on supplies normally supplied through the Oasis warehouse.

Distance of supply from Tripoli to some of the Oasis concessions is:

Concession 26— 300 miles
Concession 32— 450 miles
Concession 59— 660 miles
Concession 33—1,000 miles

Oasis attempts to standardize in all phases of its operation. Field facilities, rig motors, trucks, etc., have all been standardized in trying to eliminate unnecessary warehousing.

The supply department of Oasis in all of its warehousing facilities, employs 21 expatriates and 124 Libyan nationals. This large staff is required to efficiently warehouse materials and supply them to the field. As many as 91 trucks have been received and loaded out in 1 day from the Tripoli warehouse. Oasis also maintains a staff to clear material through customs coming into Libya.

To maintain a safe level of stock of all equipment, minimum stock levels have been set so that the supply department can independently record each time an item of stock reaches its minimum. Maximum stock levels have also been set to prevent waste and hold investment down.

Because of the long-distance hauling over extremely rough territory, mud materials and cement are purchased in special packages. Cost is approximately 50 cents per sack higher but the extra protection practically eliminates all breakage which in the past was as high as 30%.

Transportation

Oasis owns and operates 43 major transportation units. Included in this total are:

Six 552 Kenworths, 25-ton desert capacity.

Thirteen 853 Kenworths, 35-ton desert capacity.

Six 984 Kenworths, 45-50-ton desert capacity.

Five Deutz Jupiter tractors, 18-ton desert capacity.

Thirteen Deutz Jupiter flatbeds, 10-ton desert capacity.

All Kenworth units are for off-highway travel and the 984 Kenworth was designed specifically for sand sea operations. The Kenworth 552 and 853's are all six-wheel drive, while the 984 is a 6 by 4 drive. All units have Torque-o-matic transmissions and Cummins diesel engines.

The Deutz units have V-8 air-cooled engines. There has been no difficulty with the air-cooled engines working in the desert; they are proving highly satisfactory.

All Oasis drivers are Libyan nationals who have been trained on the job by transportation supervisory personnel of the company.

The truck fleet may seem rather large. However, distances are great and rigs widely scattered. As a result, the majority of trucking is done by Libyan contractors who are continually improving their equipment and personnel.

Much preplanning is necessary before a rig is moved. The geology department is normally able to predict the approximate completion date of a hole. As soon as this date is given, a transportation foreman begins to line up both Oasis and contract trucking equipment in order to have the trucks on location the day needed. In the meantime, a route is planned, examined, and prepared for the trucks to travel.

The rig is moved in two main convoys. Convoys are used so that if a truck breaks down, there will be help available. Convoys also reduce the danger and lost time caused when trucks become lost in the desert. A single-engine Beaver aircraft patrols the truck route to assist in keeping the trucks moving and to transport personnel along the route to handle emergencies.

The first convoy carries the main components of the rig. The second convoy carries the rig camp and smaller rig components. Both convoys proceed to the new location where the camp is set up as quickly as possible in order to provide living quarters during rigup. The main rig components are then rigged up and the truck conveys return to the original location to pick up the loads of odds and ends.

On a recent rig move from north Concession 33 on the Egyptian border to northeast Concession 59, Oasis used 8 company trucks and 26 contract trucks of all types and sizes. This rig was moved directly overland between the two concessions, a distance of 370 miles. No roads pass through this heavily mined area and Oasis transportation personnel scouted and laid out an overland route for the move. This route was mine-cleared and, where necessary, road-building equipment worked to make the route passable to the trucks.

Prior to the move, fuel tanks were placed at the new location to refuel equipment for the return trip. Fresh water was also placed at the new location before the move. The rig was a National 110 involving 80 truck loads. This move was completed in 15 days. An expatriate transportation foreman and two Libyan national convoy leaders supervised the entire move.

Maintenance. Equipment failure under rugged driving conditions is a major transportation problem. To be effective, maintenance must be available for all equipment not only at the main centers of operation in Tripoli and Benghazi but also at such field locations as the Dahra warehouse. So, in addition to the complete maintenance facilities for all heavy trucks and most light vehicles at Tripoli and Benghazi, many repairs are made at the Dahra field garage.

There are radio units mounted in transportation supervisory vehicles. Thus, spare parts and mechanics can be summoned to remote areas where breakdowns have occurred. Then, repairs can be made on the spot with the least possible down town.

Well completions. Typically, wells are completed by setting casing through the productive zone, perforating with four jet holes per foot, and acidizing with 100 to 300 gal. of 15% HCl acid per foot of perforated interval. Low breakdown and displacement pressures are normal in Concession 32.

Acid is imported in lead-lined steel tanks containing 485 gal. of 31.45% HCl acid. Each tank makes 1,000 gal. of 15% HCl. Acid is mixed on location and pumped with regular cementing equipment carried at the well site.

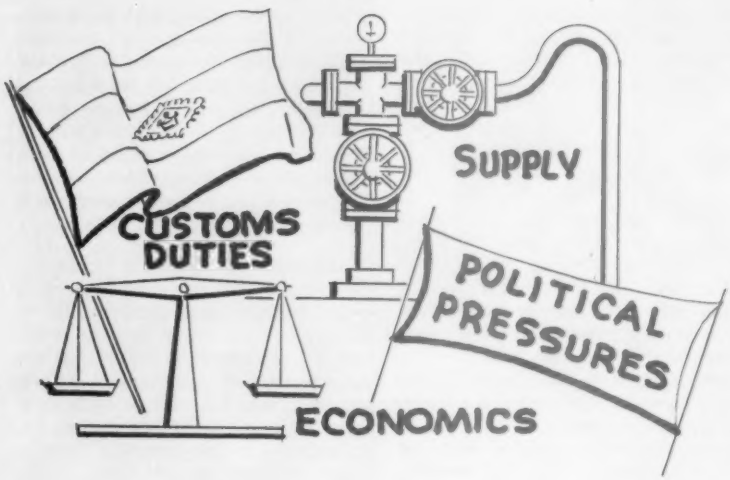
Small-volume acid jobs have been very successful in cleaning up the well and removing any well-bore damage resulting from contact with water base drilling mud.

The producing zone in Concession 32 is water-sensitive. During completion, every attempt is made to keep water and mud off the formation.

What's involved in European

Importation of liquid methane?

Problems are many, both technical and legal, but none appears to be serious roadblock



THE IMPORTATION of liquid methane into European countries involves a great number of legal problems but most of them are routine and none should present much of an obstacle to shipments on a commercial scale.

This is the conclusion of Hedley Parker, legal advisor to the British Gas Council, London, as expressed in a paper delivered before the International Bar Association in Salzburg.

Parker participated in the arrangements whereby liquid methane from the United States was imported into England in the "Methane Pioneer." This was—and still is—an experimental project and therefore perhaps encountered fewer problems than might be faced by a large-scale commercial venture. However, the legal steps taken suggest a pattern to be followed in planning the importation of liquefied natural gas to any European country.

The problems outlined by Parker covered the structure of the gas industry in the importing country, obtaining supply and arranging for export, safety measures, customs duties, economics, and political considerations.

Arrangements to bring liquid methane into England probably were made easier by the fact that the British gas industry was nationalized in 1949 and therefore was unified and under a form of government control.

British gas industry. Prior to nationalization England was served by 275 municipally owned gas plants which produced about one-third of the nation's total, and by more than 700 privately owned plants which were regulated as public utilities.

After nationalization all properties were pooled under the control of 12 area gas boards which assumed the assets and obligations of the individual systems. While not directly subject to a profit motive, these boards are required to break even after providing for debt funding, depreciation, a reserve fund, and contributions to the central Gas Council.

The Gas Council is composed of a chairman, deputy chairman, and the chairmen of the 12 area boards, and it has a duty to advise the Minister of Power on questions affecting the gas industry. The council raises capital for the boards, conducts research, and generally assists the boards in matters which can conveniently be handled centrally.

As part of its research program the Gas Council joined with BP Exploration, Ltd., in a search for natural gas in England, and is continuing research into processes for better gasification of oil and low-grade coals. As the search failed to reveal supplies of natural gas suitable for general commercial exploitation, the council turned to examination of the project for liquefaction of methane which was in progress in the United States.

Export arrangements. Continental Oil Co., of Houston, Tex., and Union Stockyards of Chicago, Ill., had perfected means of liquefying methane from natural gas and of transporting it at atmospheric pressure in insulated barges. The two companies formed Constock International Methane, Ltd., and the British Gas Council entered an agreement to jointly finance experiments in ocean shipment. A new company, British Methane, Ltd., was incorporated in the Bahamas, and this company purchased and converted a small tanker, the "Methane Pioneer." The Ministry of Power approved the use of research funds and foreign exchange for this project.

There was no difficulty in obtaining supplies for the experiment, since Constock had a liquefaction plant and loading facilities near Lake Charles, La., Parker pointed out:

"In these circumstances there was no difficulty in getting the gas out of the country and not export duties had to be paid, a situation which would not necessarily hold for other possible sources of gas in other parts of the world if transportation were to be undertaken on a larger scale."

The largest of the area boards, the North Thames Gas Board, built a terminal at Canvey Island, near London, and close to its Romford gas works. This board undertook the experiments involved in gasifying the liquid methane, reforming it to reduce its calorific value by half to equal that of its manufactured gas, and introducing the methane to its city mains mixed with manufactured gas.

Safety measures. Tests showed that handling liquid methane was potentially less dangerous than gasoline be-

cause the liquid is constantly boiling and there is continuous gas pressure in the free space above it preventing the entry of air which could cause an explosion.

In the United States the safety measures were approved by the American Bureau of Shipping, the U.S. Coast Guard, and the American Petroleum Institute.

In England similar approval was obtained from the Chief Inspector of Explosives at the Home Office, the Ministry of Transport, Lloyds Register of Shipping, the Secretary of State, and the Port of London Authority.

Normally the importation of liquid methane would be subject to a customs duty of 10%, but this was waived by a special exemption granted by the Treasury.

Economics

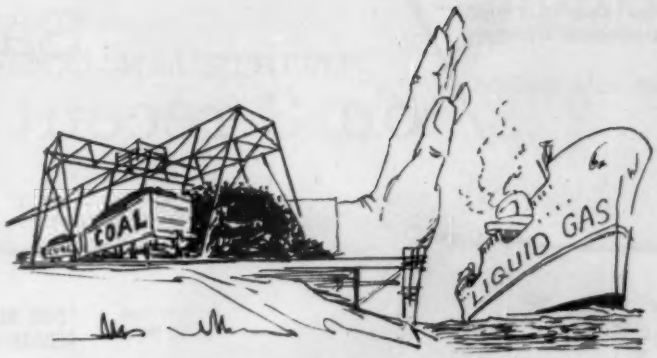
After explaining the legal steps in detail, Parker discussed some of the economic and political aspects of a large-scale commercial importation of liquid methane.

"The development of the gas load in the United Kingdom since the war has not progressed at the same pace as it has in the United States," he said. This must be attributed in part to the fact that owing to the increased price of the carbonization of coal and other inflationary influences it has not been possible to keep the price of gas as stable as would have been wished.

Furthermore, the people of the United Kingdom do not yet demand such high standards of domestic heating as prevail in America. There can be little doubt that the future development of the gas load depends on its competitive position in relation to alternative fuels and this is a question of price.

In its search for means of reducing the price of gas the Gas Council is considering in detail the possibility of establishing a national grid system into which gas, manufactured from low-grade coals at or near the pit head, would be fed. To supplement these supplies substantial quantities of gas arriving at ports, on the perimeter of the grid, would undoubtedly be useful.

This could be met by the gasification of oil but supplies of high-grade, clean, nontoxic gas at the right price might fit well into the plans which the Gas Council is studying. These plans also take into account the possibility of finding geological formations suitable for the underground storage of gas, and the higher the calorific value of the gas stored the greater the use that can be made of the available storage capacity.



"... England fuel policy would require the maximum use of fuels which are available in the country and restriction on the use of imported fuels."

Shipping cheaper. Clark[1] points out that as far as economic studies have disclosed up to the present it is probable that over distances greater than 1,000 miles (1,600 km.) it will be cheaper to transport liquefied gas by ship than to transmit it through a pipeline.

He suggests that it may be possible to transship liquefied gas over distances up to 4,000 miles (6,500 km.) at a cost comparable to transmitting gas 1,800 miles (3,000 km.) by pipeline.

The recent finds of gas in the Sahara Desert mean that large supplies of such gas are in existence in such circumstances that to get them to England would require a much shorter haul than was probably visualized at the time when the experiments with "Methane Pioneer" were first embarked upon, he said.

In these circumstances it seems that the question of whether the importation of liquid methane into England can be undertaken economically will depend very largely on the price which has to be paid for the gas at source.

Hassi R' Mel gas. There are many projects under consideration for bringing gas from Hassi R'Mel to Europe and the technical possibilities of pipelines at various points across the Mediterranean are being looked at. If the first stage can be achieved there would appear to be no reason why a second stage of piping across the English Channel to England should not follow.

Much study will have to be given to the various proposals to assess their economic merits, but conveyance in liquid form by sea seems likely to remain a strong contender, Parker said.

Politics

The general fuel position in England is, however, similar to that which is found in Europe and in a number of other parts of the world. There is at present a surplus of coal (the country's only indigenous fuel) and oil products. The coal industry is going through a difficult period and the National Coal Board is having to stock many millions of tons of coal.

It is hardly surprising, therefore, to find in the country a political faction which seeks the introduction by the government of a fuel policy. This would require the maximum use of fuels which are available in the country and restriction on the use of imported fuels.

Others state that the use of artificial means to maintain the consumption of coal would keep general fuel prices high and thus endanger the competitive position of British manufacturers in overseas markets, in relation to manufacturers in other countries who remain in a position to take advantage of the cheapest fuels whatever their source may be.

When the final details of the technical and economic factors have been assessed, there should be no serious barrier to the use of considerable quantities of natural gas in the United Kingdom. It is to be hoped that the problems of the lawyers in the process of making available to the country this valuable source of power which has, in many parts of the world, been wasted for so long, will be no more serious than they have been in the past, Parker said.

References

1. "Sea Transport of Liquid Methane," by L. J. Clark, assistant chief engineer of the North Thames Gas Board, submitted to the meeting of the World Power Conference in Madrid.

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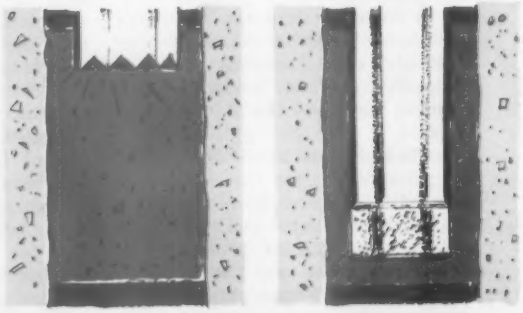

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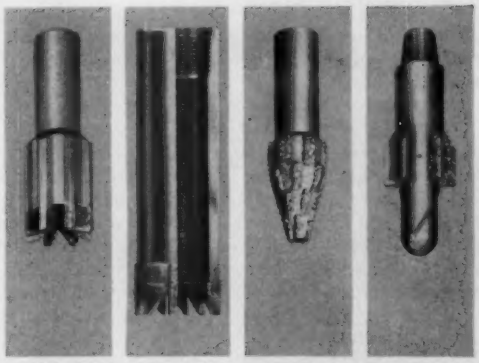

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What does "oversupply" mean today?

BY P. H. FRANKEL
PhD (V.I.N.D.), M. Inst. F.,
F. Inst. Pet.

. . . economist who has spent all his working life within the orbit of the oil industry. Until 1955 he was actively engaged in oil refining and distribution, mostly in England, Italy, and Poland. He is now a consultant economist in London (Petroleum Economics, Ltd.). He has delivered papers at the last three World Petroleum Congresses.

IN ONE of the Moliere comedies someone who for the first time learns of the difference between poetry and prose considers in wonderment that all his life he has been speaking prose without realizing it. Similarly, the oil industry has been beset by, or perhaps blessed with, the problem of oversupply through most of its peacetime history, but judging by some of the recent comments one would think that this was new and hitherto unheard of.

To this "over" supply our industry owes its buoyancy and aggressiveness; besides it is the only alternative to scarcity. As the actual result of exploration is altogether uncertain, often more oil is found than can be used at any given time. Since exploitation in prolific fields is often cheap compared with exploration, reserves—once discovered and delimited—tend to press on the market more strongly than does, for instance, coal in the ground, whose actual mining involves very considerable prime cost.

What changes in the course of time (providing a new "image" of the almost perennial phenomenon of oversupply) is the way this expresses itself and the means by which supply and demand are being adjusted to each other. Public opinion world-wide is just now bewildered by the apparently sudden change in the climate in which the oil industry operates. The investor oil shares have moved from the top to the bottom of the form, these things have occurred because we had become too used to a certain set of circumstances which were thought to be "normal" and therefore everlasting.

The changes we see are more pronounced in the international field than in the U.S.A., where crude supply continues to meet demand by courtesy of state regulatory bodies—but the U.S.A. has today only 46% of the world's oil consumption and 35% of its production, against its 1950 shares of 59% and 52% respectively.

In the rest of the world (outside the Soviet bloc) since the end of World War II the position was determined by the fact that crude-oil resources were in the hands of a very small number of companies whose activities covered the world not only in the geographical sense but also in depth. As they were fully integrated, most of their oil did not, economically speaking, break the surface until it had reached the point of end use, the ultimate customer. This had two results:

1. The intermediate prices—those for crude oil and for bulk products ex refinery—had for some time and to a certain extent **notional** rather than straight economic or commercial relevance. They were important more for taxation and foreign-exchange purposes than as signifying a definite position in the economic chain from the oil well to the service station or fuel-oil tank.

2. Because such a large part of the oil moved through integrated channels, the problem of allocating outlets to individual sources of supply (viz. producer countries) did not arise openly. There was no need to solve it either in the form of cost or price determining directly (who was to supply what to whom), or in the form of spelled-out proration, national or international. The **invisible** proration, however, was achieved by most of the producing companies having a well-defined share in the market—not by agreement or decree but simply by operating in most countries through their own elaborate and well-entrenched organizations. The equilibrium to which we have grown accustomed had been rendered yet more stable by a number of offtake agreements between oil companies, mostly arrived at in 1947.

Arm's-Length Transactions

There remained, however, a certain proportion of free-lance activities, of arms-length transactions. Their volume was always small, at least in the Eastern Hemisphere. They were comparatively larger in South America where the conspicuous buying methods of state-controlled oil companies, mainly in the Argentine and Brazil, called forth the competitive instincts of oil companies everywhere.

Also, it was to be expected that the few nonintegrated bulk buyers left elsewhere would make the best of their tactical advantage, and it is there where the "discounts"—lately so much discussed—started some years ago in a modest way. As long as they were small (and quite often camouflaged by putting transportation at the buyer's disposal at low rates, by interest-free credits, or favorable processing deals) there were no serious repercussions on the general run of integrated operations.

As time went on, prices to arms-length buyers tended to fall simply by the classical process of sellers fighting for a contract in a buyers' market. At that stage Russian competition came in, accentuating a trend which, however, had already existed. Almost the same applies to the "newcomers" to production about which so much is being talked nowadays. Except for some medium-sized operators in Venezuela none of them has yet developed any substantial production. As potential suppliers they are relevant, but the current market position has been determined by the traditional suppliers.

The few independent refiners, having difficulties in selling their products, had to pass on most of the additional margin which the crude purchased at low prices had tended to give them. Consequently, the affiliates of international oil companies in some countries had to "meet competition" by reducing their products prices. By then the chickens had come home to roost and the affiliates had to call upon their parent companies for relief, i.e. for cheaper crude.

The international oil companies have been criticized in the past. Economists and others have sometimes pointed out that prices for Middle East crude oil, which in time were linked to a number of different reference prices but never to their own cost of production, resulted in a return on invested capital whose magnitude was not compatible with free-competition economics. They considered that consuming countries were being charged prices which were too high, and there were accusations of collusion among oil companies.

Incidentally, the same accusation

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that oil companies were exploiting them was voiced by some producer-country spokesmen, but last year Mrs. E. Penrose pointed out forcefully that if there had been such collusion it was one which worked in favor of producer countries' tax receipts, rather than to their detriment[1]. Thus one could conclude that the idea of calling for a checkup of the gift horse's teeth might not have been a very good one.

From the consumer countries' point of view the erosion of the price structure, by marginal sales having become more and more relevant for the whole, is welcome. It can also be said that what now happens only goes to show that the basic factors in the supply-demand situation are bound to make themselves felt in due course.

At least some of the oil companies have now seen the writing on the wall. They argue that some of the margins which were earned hitherto in exceptional circumstances could have been maintained only by a watertight agreement among companies which is in present circumstances out of the question, or by governmental and international compact which even if it were attainable would be undesirable.

In the absence of such over-all settlement there would be a real surge of new entrants (attracted as they have been of late by apparently high profits to be made) which would result first in loss of business by the established companies and, in the end—by the dialectic of competition—in a thinning out of margins. Faced with this prospect some companies (or at least one of them) seem to have decided that it is better to push than to be dragged and the initiative is being taken towards "realistic" margins and prices. Thus newcomers may be discouraged, the burden of taxation reduced, and farsighted and strong companies may enter the new phase with their share in the markets unimpaired if not in fact enhanced.

Lately the producer countries have started to reproach the companies for not doing (or not doing effectively) what they now say the companies are expected to do: manage supply (i.e. "oversupply") in such a way as to maintain prices at their current level. In doing so they forget that they themselves have been in the habit of pressing the companies to take from them then and there more and yet more oil—if necessary at their neighbors' expense.

There is a good deal of sense in the producer countries' current way of thinking and in their realization that lower prices would not now sell much more oil in view of the U. S. import control and the need for some consumer countries to protect their indigenous coal.

Anyway, the call for restraint in quantity to safeguard the price is a truism which has been familiar to Texas producers for the last 30 years.

Today the onlooker has an opportunity to behold a fascinating picture. Although the oil companies now tend to move from a state of equilibrium to one of more militant competition, there are governments who envisage fitting supply to demand, albeit on their own terms.

It remains to be seen which of the two concepts will prevail. More intensive competition resulting in lower returns would alleviate oversupply to some extent; low-cost crude oils would be used in preference to less economic ones, financially strong and efficient oil companies might survive, where weaker operators might be expected to disappear from the scene.

This is a situation for which Mr. Khrushchev would undoubtedly have a Russian proverb and here it is: "By the time the fat one gets thin, the thin one is dead." Yet in the present circumstances it is perhaps not altogether certain who will in fact be the fittest who would survive: some people—lean and hungry—not weighed down by the relics of a more remunerative past and knowing how to play along with governments, may have some considerable staying power.

On the other hand, a formula acceptable to all producer countries, and not so unpalatable to consumers that it would be resisted outright, may be very difficult to devise. It may be still more difficult to live with. The truth is that in present circumstances there is no ready-made solution to the problems of the oil industry and we are undoubtedly moving through a difficult period in which straight political factors will be at least as important as economic ones.

Reference

1. E. T. Penrose, "Profit Sharing Between Producing Countries and Oil Companies in the Middle East": Economic Journal, June 1959. "It is not clear that a concerted international attempt to break down the control of distribution channels by the major companies would, even if successful, benefit the Middle East countries; it is equally possible that any benefit would go primarily to the ultimate consumers of oil and oil products through a subsequent fall in prices.

"Perhaps consumers are also being 'exploited' by the oil companies, and it is possible that the disappearance of this 'exploitation' would bring in its wake a substantial fall in the oil companies' profits and a consequent fall in the revenues received by the producing countries whether or not they ran their own industries. Thus the elimination of this source of alleged exploitation might leave the producing countries with much less than they received under conditions in which the oil companies can exploit both their suppliers and their customers."

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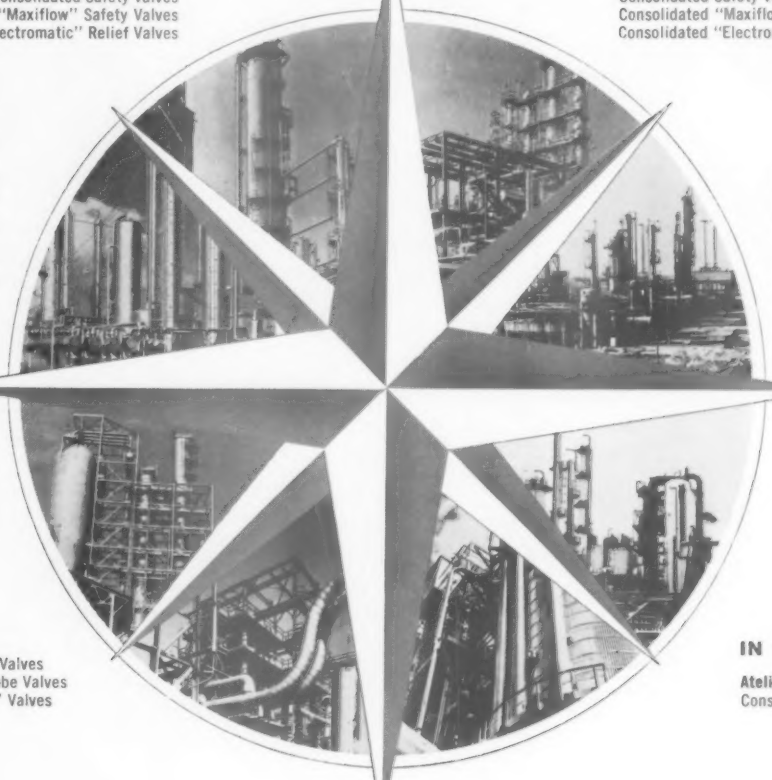

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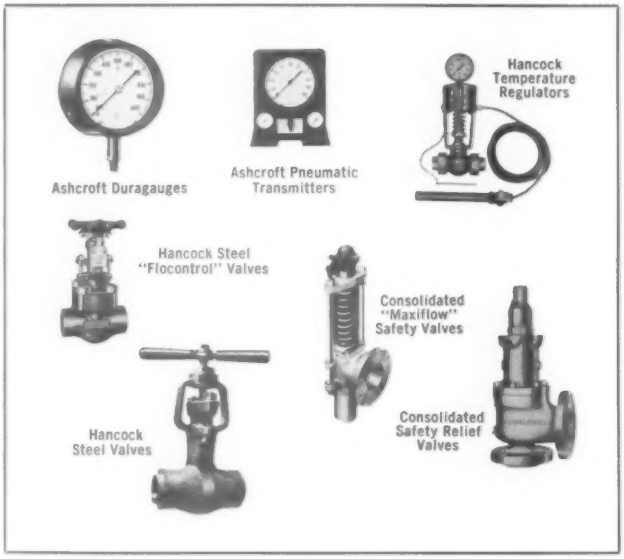

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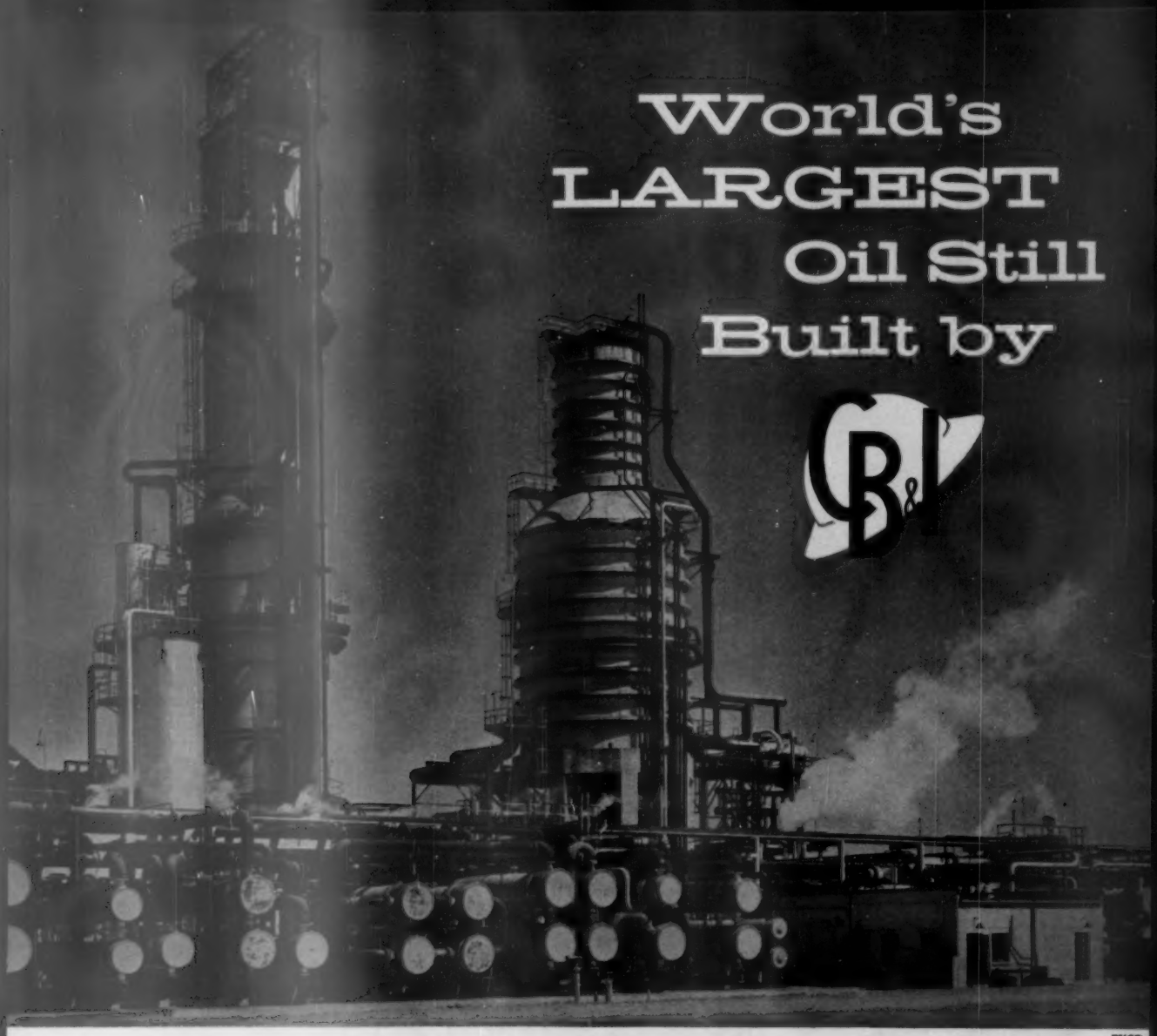

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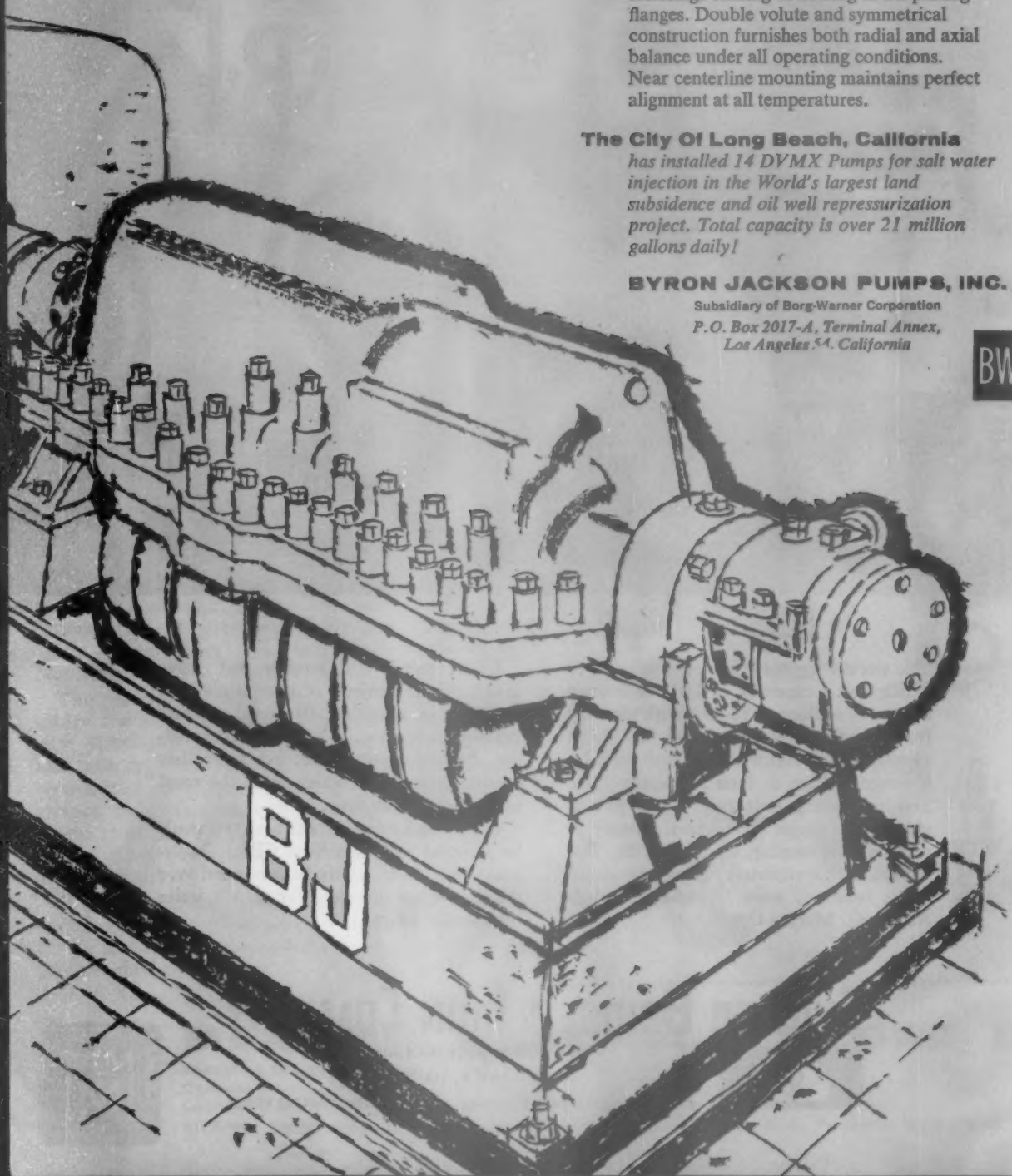

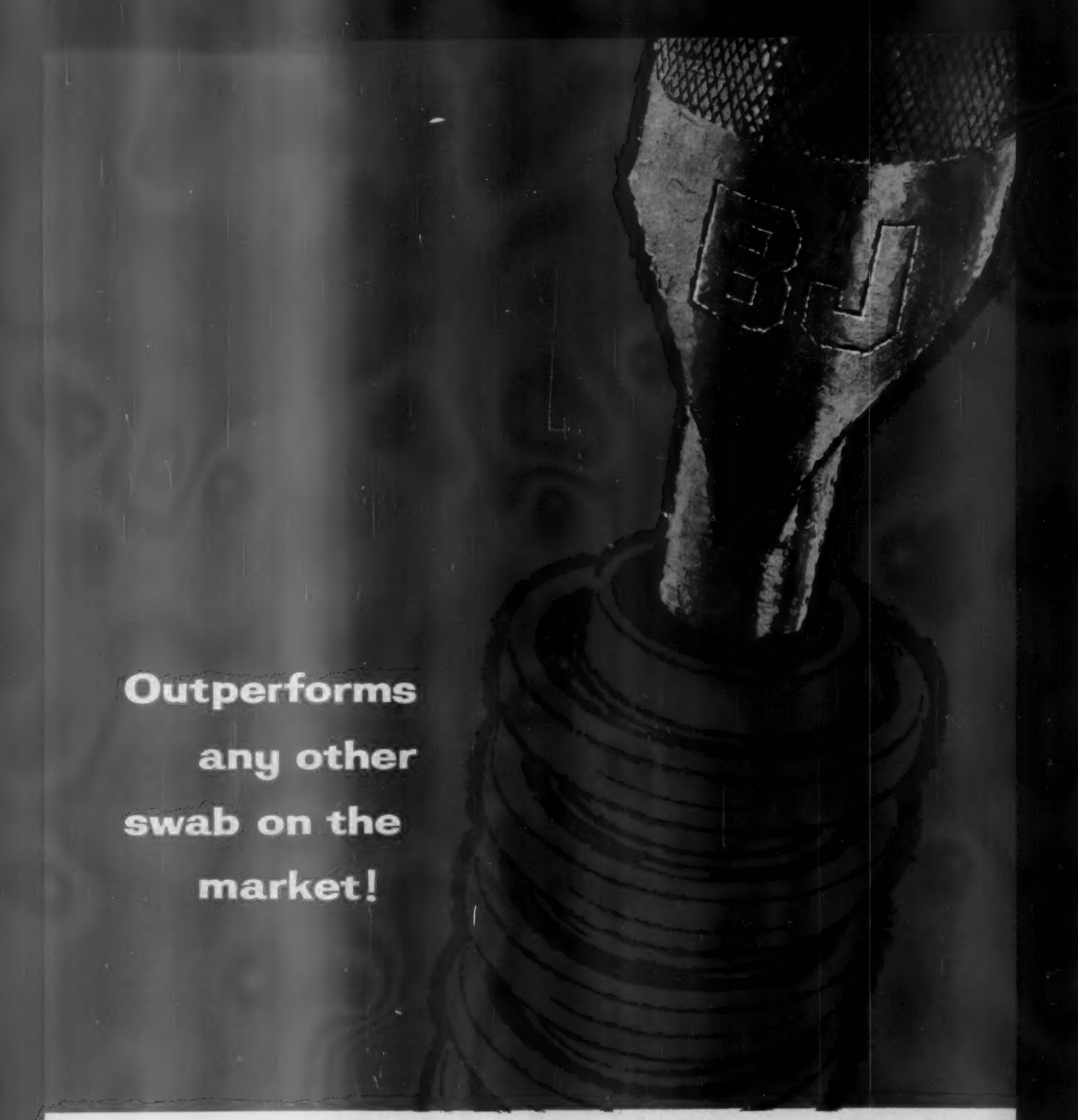

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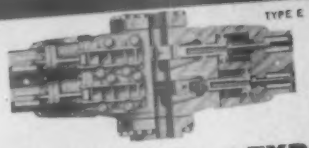

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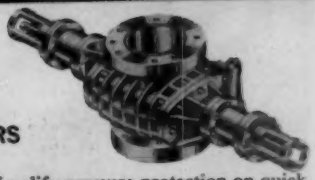

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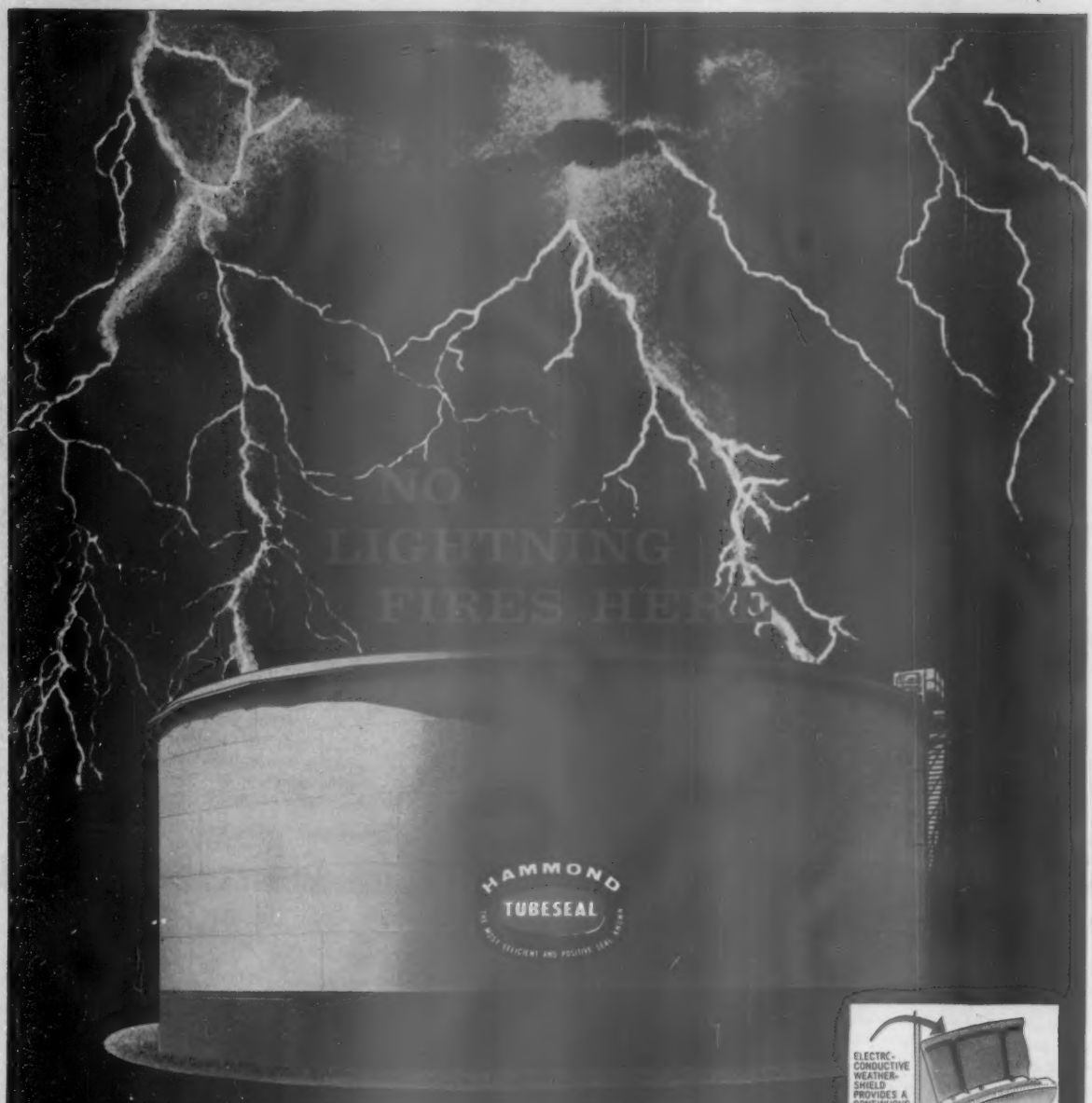

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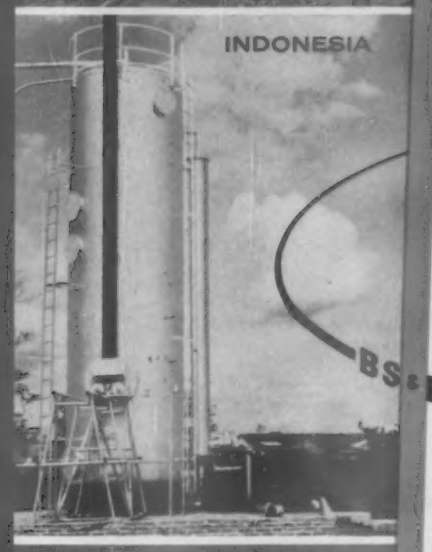

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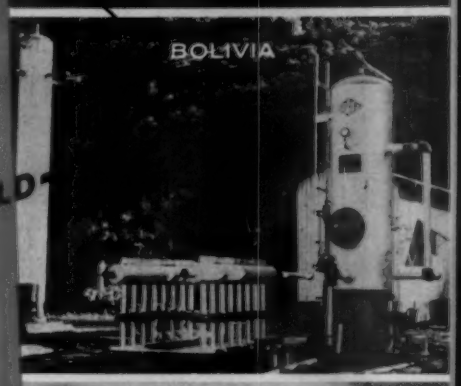

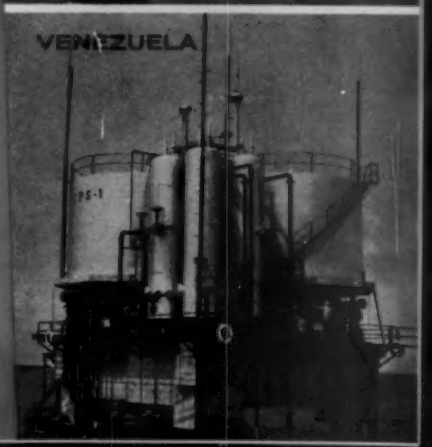

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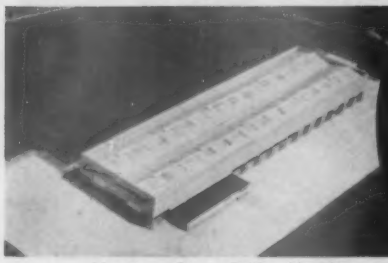

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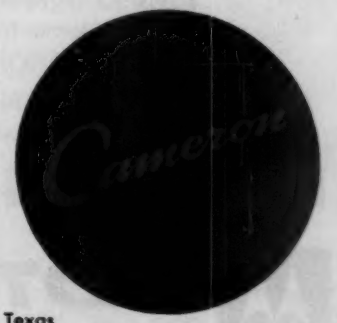
Edmonton, Alberta, Canada

Beziers, Herault, France

Five Plants now produce the Famous Cameron Pressure Controls

Cameron products are available and manufactured world-wide in five Cameron plants, France, England, Canada, Mexico and the United States. Processes in each plant follow the same specifications and rigid controls established by the home plant in Houston, Texas. All parts regardless of place of manufacture, are interchangeable for like parts on all Cameron equipment. Call, write or come by any one of the Cameron plants or offices located throughout the world.



Cameron Iron Works, Inc., P. O. Box 1212, Houston, Texas

NO PLACE FOR SISSIES

MOTOROLA 2-WAY RADIO TAKES A BEATING...
because it's built to take it!

A 2-way radio is a precise, complex electronic instrument. But unless it is *rugged* too—unless it can shrug off jolts and vibration and come back for more—it just can't go to work in the oil fields.

Motorola engineers *design* a radio to take it. Extensive field tests *make sure* it's no sissy—Motorola literally beats the "bugs" out. Then a tough, rigid quality control setup *keeps* them out.

This kind of consistent leadership in research, development and engineering has led to a radio that will stand up to rough treatment and still deliver dependable service—day after day. You'll see *why* when you check with your local Motorola representative—he'll give you all the facts. Write:

MOTOROLA 2-WAY RADIO

Motorola Communications & Electronics, Inc., 4501 Augusta Blvd., Chicago 51, Illinois • A Subsidiary of Motorola Inc.

Seamless pipe and tubes

New plant of
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France

Gerep Arthus

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Telex : 27.627 COTUNOR Paris
Cable : COMPATUNOR Paris

"Compagnie des Tubes de Normandie" and "The NATIONAL SUPPLY COMPANY" have signed technical assistance agreement ; in addition control and inspection of its total production is supervised by representatives of the "MOODY ENGINEERING CO" on location.

C.T.N. is an API licensee

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NEW YORK / U. S. A.
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Correspondent of
Compagnie Pont-à-Mousson
and affiliates

PONT-A-MOUSSON
FRANCE

See : the Composite Catalog of Oil Field Equipment and Services 1960 - 61
pp. 3820 to 3826

a christmas tree is only as strong as its weakest seal

Rector makes the hook-up that is Sealed with Steel throughout

Rector wellhead equipment is designed to insure a leak-proof seal at all connections. Compare Rector's metal-to-metal seal features with any equipment on the market using resilient packing between casing and tubing strings. The Rector principle of reinforcing temporary organic packing with a permanent ring of steel insures a positive leak-proof completion every time. Rector's built-in welding ring coupled with an API ring gasket is easy to install, immune to corrosion inhibitors, will not flow under high pressure or temperature, will not freeze or contract under low temperature, will not burn out, and never requires maintenance or replacement.

There are no weak links in your completions, when you specify Rector equipment at your favorite supply store, or from your Rector representative.

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Rector

Well Equipment Co., Inc.

Making the Oil Industry Safer!

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EXPORT REPRESENTATIVES: Continental-Emsco Co., Mid-Continent Supply Co., Oilwell Division of United States Steel Corporation

PESA

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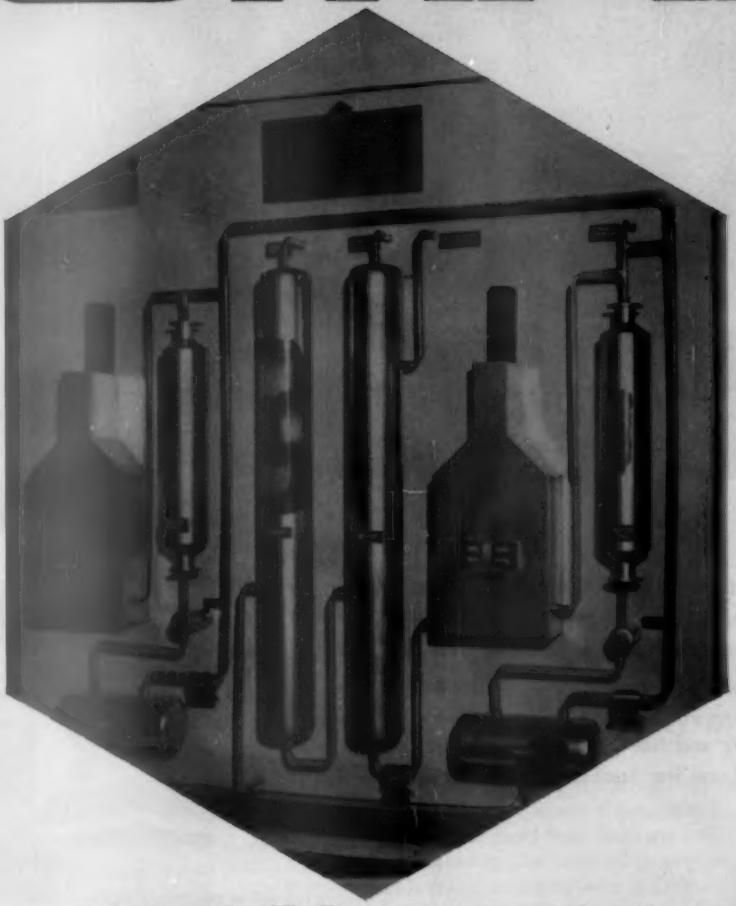
NOW... MAKE HIGH-VALUE GASOLINE
FROM LOW-VALUE DISTILLATES

with the versatile new UOP process...

LOMAX

TRADEMARK



Model of LOMAX process which produces exceptionally pure, olefin-free products, a predominance of branched isomers—with greatly reduced quantities of light gases plus other important benefits.

Are you suffering from an overabundance of middle distillates? Or producing more vacuum gas oil than you know what to do with? Then your answer may be LOMAX, the flexible new UOP process that lets you make what you want *when you can sell it!*

Through reaction of hydrocarbons with hydrogen in the presence of a new UOP catalyst, LOMAX converts middle distillates into gasoline and distillate fuels—in just about *any ratio you want.* You make as much of each as you can sell, no more, no less.

UOP's highly flexible new LOMAX process may be used to supplement existing facilities, or as a basic cracking operation in a new installation. UOP engineers will work with you in preparing a case study showing how LOMAX will fit into your refining picture. Write, wire or phone for details.

UOP
UNIVERSAL OIL PRODUCTS COMPANY
30 Algonquin Road, Des Plaines, Illinois, U.S.A.

WHERE RESEARCH TODAY MEANS PROGRESS TOMORROW

Lone Star ... new international source of API Casing, Tubing and Line Pipe

Long a major manufacturer and supplier of pipe to the oil and gas industry of North America ... Lone Star Steel Company's fine API pipe is now available to all the Free World.

Lone Star Steel has one of the most modern, completely integrated plants on the globe. Quality is carefully controlled from mining of the ore to completed casing, tubing and line pipe. Realizing that the *best pipe* requires the *best skelp*, Lone Star Steel has become the skelp specialists of the world.

Neighbor, wherever you are, specify Lone Star and we both get a good deal.

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Hole Enlarging

You can get from Grant!

This is just one of the three *families* of Grant Tools made for reaming, hole enlarging and stabilizing. For full information on these, and a wide range of other down-hole and surface tools made by Grant, send for your copy of the complete Grant Catalog today, or see the Grant section of Composite Catalog!

Every hole enlarging job presents its own special set of conditions. That is why Grant, with more experience in this highly specialized field than any other manufacturer, has engineered specific tools for *your* particular job. For opening rat-holes . . . enlarging hole for the casing string . . . under-reaming before cementing—in any well—Grant's 30 years of specialization have produced the right tool for the job at hand.

When hole enlarging is your requirement, *remember that only Grant makes and services all types of hole enlargers in active oil territory everywhere!*

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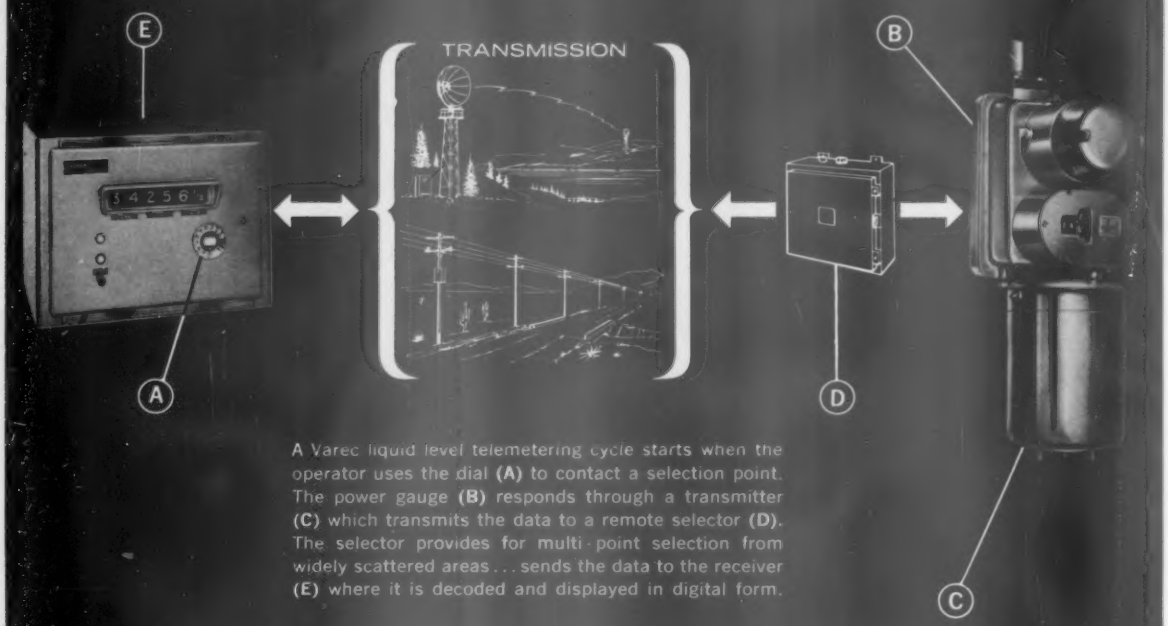
VAREC PULSE CODE POWER GAUGE SYSTEM

ACCURACY-TO 1/16 INCH OR BETTER IN GAUGING AND TELEMETERING LIQUID LEVEL DATA



A Varec liquid level telemetering cycle starts when the operator uses the dial **(A)** to contact a selection point. The power gauge **(B)** responds through a transmitter **(C)** which transmits the data to a remote selector **(D)**. The selector provides for multi-point selection from widely scattered areas... sends the data to the receiver **(E)** where it is decoded and displayed in digital form.

Varec combines its new DYNAMATIC* 8400 Series Power Driven Tank Gauge with the Varec Pulse Code to provide an accurate, reliable liquid level measurement/telemetering system. The new system transmits data 'error-proof' over a single communications channel... gives a reading accurate to 1/16 inch in just 5 seconds.

Varec's pulse code method of dots and dashes supplies a fast reading with a slow pulse rate of 5 pulses per second so the transmission channel is not critical. Wiring costs are reduced with a single transmission circuit between the remote selector and receiver. (For smaller installations, a direct-wired system can be used instead of selectors.)

Standard receivers are available in capacities of 10, 100, or 1000 point selection.

ONLY THE **VAREC** SYSTEM OFFERS ALL THESE ADVANTAGES:

ACCURACY: Provides 1/16 in. gauging accuracy with new Power Driven Tank Gauge... transmits 'error-proof' reading by pulse code.

RELIABILITY: Consists of simple, compact electro-mechanical components... needs no vacuum tubes or other complex electronic equipment.

FLEXIBILITY: Designed on a building block principle that permits unlimited variety of system arrangements such as telemetering other measurements... or adding remote control, data logging and alarm systems.

ECONOMY: Requires just a simple transmission circuit... a metallic pair or a carrier derived channel operated over existing lines or microwave. Costs little more than conventional systems.

EXPERIENCE: This highly accurate, reliable liquid level measurement/telemetering system offered by Varec, pioneers in the gauging field... over six years experience in pulse code applications.

For complete information, write for Bulletin CP 3707, Dept. OGJ-1224-I.

"Varec" TRADE ® MARK

*Trademark

THE VAPOR RECOVERY SYSTEMS COMPANY
2820 North Alameda Street • Compton, California
Branches and Representatives in Principal Cities

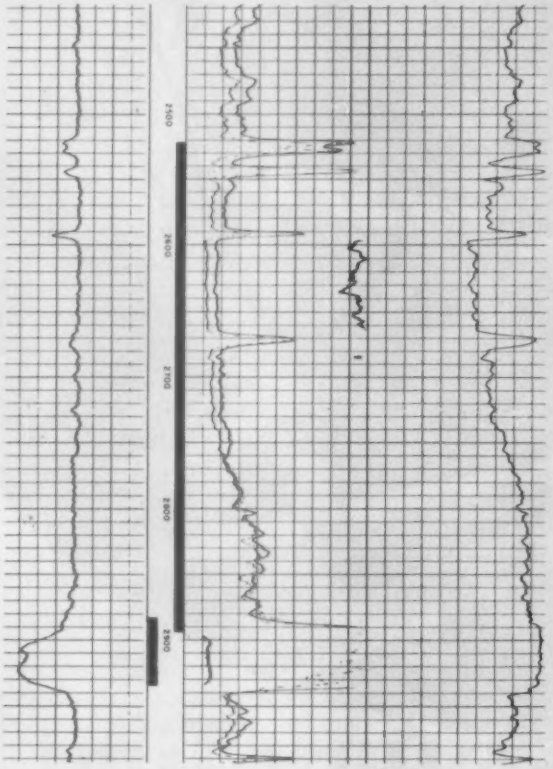
Here's How One Operator Solved Two Completion Problems and Saved Rig Time Too!

A rank wildcat, Stribling #1, was spudded in White County, Arkansas by Ambassador Oil Corporation with T.D. projected around 4500 ft. When the well was bottomed at 4511 ft., logs were run as the first step in evaluating formations and their producing potentials. A study of these revealed two interesting zones well up the hole. The logs indicated questionable permeability in sands above 3000 ft. and showed good departure of the resistivity curves.

Mr. A. J. Howell, Division Geologist for Ambassador, was faced with the problem of whether to set casing or not. A decision was made to run a Drill Stem Test. This, however, could mean serious trouble and add to the problems already encountered.

The area is notorious for subsurface conditions which vary from extremely hard sands to sloughing and swelling shales. Because of these conditions, fishing jobs are not uncommon.

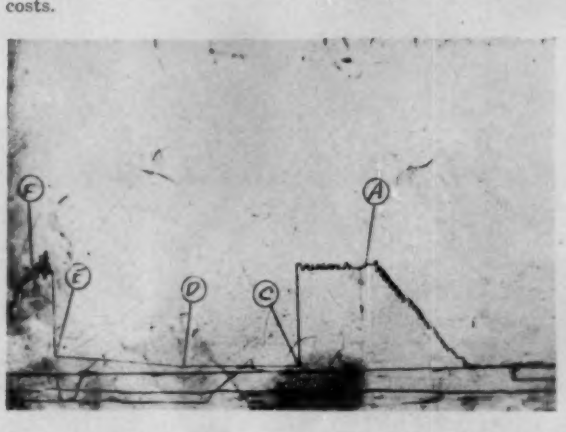
Trouble had already been encountered in getting logging tools in and out of the hole. To be absolutely safe, the operator wanted to test the formations without running a long tail pipe which might become stuck and require an expensive fishing job.

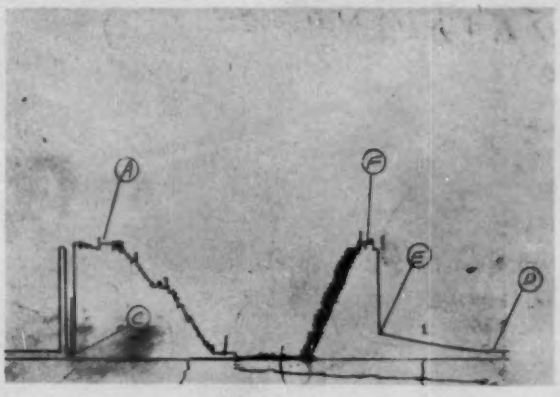


Johnston Testers solved two problems while testing the interesting formations. First, long tail pipe was not run during the tests because the new Johnston Selective Zone Anchor was used. Secondly, both zones were successfully tested. From the information gathered, it was decided that the formations definitely were not commercial producers and casing was not set needlessly in the well.

We quote from a letter written by Mr. Howell, "I would like to commend you for the excellent performance of both personnel and equipment in Drill Stem Testing our # 1 Stribling well in White County, Arkansas. Your Open Hole Selective Zone Tester worked perfectly in two Drill Stem Tests run at the well. From start to finish, both tests were run in less than 14 hours total rig time."

Because of the speed at which these tests were run, considerable rig time was saved, thereby reducing the overall costs.





Testing problems such as these are solved by Johnston every day. When you have a question about any zone... when you want formation information . . . call Johnston Testers!

JOHNSTON TESTERS

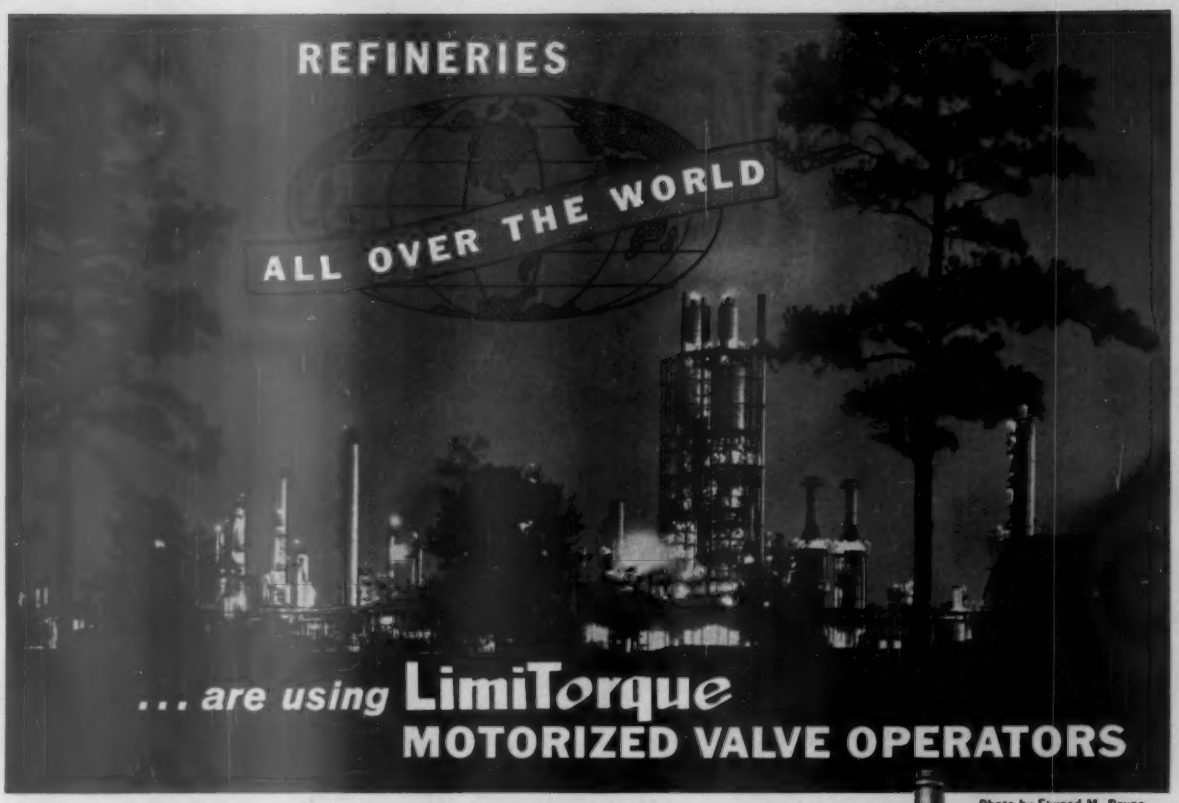
Houston, Texas Calgary, Canada

"...pacing the pipeline construction industry
for more than a quarter century"

price tower

PIPELINE
H·C·PRICE·CO
CONSTRUCTORS

bartlesville, oklahoma
cable address: HCPCO

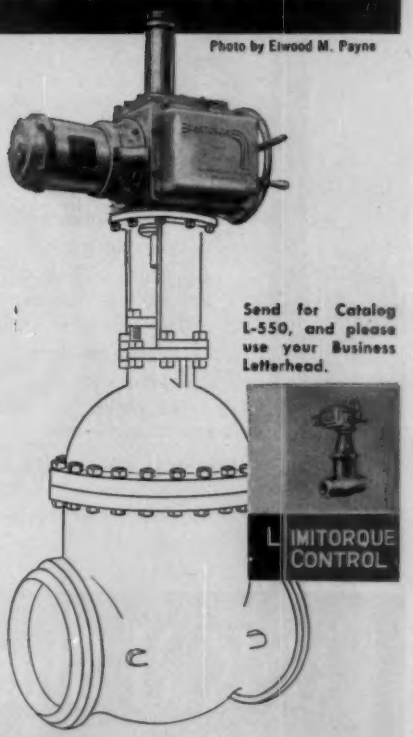


... are using LimiTorque
MOTORIZED VALVE OPERATORS

Photo by Elwood M. Payne

It is highly significant, that wherever there is a Modern Refinery, you will find vital valves operated day and night by LimiTorque Push-Button Motorized Controls . . . The reasons for such wide-spread use are many; first of course is their ABSOLUTE DEPENDABILITY under all pressure, temperature, and service conditions . . . Second, LimiTorque operators are ruggedly built, yet as accurate as a fine watch . . . And, because of a specially designed Torque Limiting Mechanism, they ELIMINATE ANY POSSIBILITY OF DAMAGE TO VALVE PARTS during the cycle of operation . . . also vitally important is the fact that they save TIME, LABOR AND MONEY . . . and, it should be kept in mind that LimiTorque is manufactured by one of the largest gear and geared products manufacturers in the World . . . it is the result of 28 years of experience.

For further information consult your valve manufacturer, or your nearest LimiTorque Sales-Engineering Office.



Send for Catalog L-550, and please use your Business Letterhead.

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INDUSTRIAL GEARS & SPEED REDUCERS • LIMITORQUE VALVE CONTROLS • FLUID AGITATORS • FLEXIBLE COUPLINGS
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In oil refineries,
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GKN Alloy Steel
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Bolts and Nuts
for high-pressure,
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and moderate duty.
All these fastenings
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GKN quality
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Studs, Bolts, Stud Bolts & Nuts for petroleum, chemical and power undertakings are made, under strict Quality Control, to the latest British and American specifications.

Guest Keen & Nettlefolds (Midlands) Ltd., Bolt & Nut Division, Atlas Works, Darlaston, England.

D/ST.S/715

Oil company reports PERFORMANCE PLUS with Sumitomo steel tubing

A leading drilling company in Texas reports that Sumitomo tubing far exceeded API specifications when run as drill string, despite 46 rugged round trips in and out of a 5700-ft. well under 1200-lb. mud pressure.

Performance like this shows why Sumitomo steel pipe and tubing, produced in accordance with API, ASTM and many other international standards, are exported in all sizes and grades to every major part of the world.

Available in API Standards in the following sizes:

Casing 4½" to 13⅜" O. D.
Tubing, 1.660" to 4½" O. D.
Line Pipe 0.840" to 14.00" O. D.
High Test Line Pipe 6⅝" to 14.00" O. D.

LEADING MANUFACTURER OF STEEL TUBES AND PIPE WIRE RODS AND ROLLING STOCK PARTS

SUMITOMO METAL INDUSTRIES, LTD.

HEAD OFFICE: OSAKA, JAPAN
CABLE ADDRESS: "SUMITOMOMETAL OSAKA"
NEW YORK OFFICE: 420 LEXINGTON AVENUE, NEW YORK 17, N. Y.

what's your best estimate?

. . . a quiz for refinery men who want to keep posted

QUESTION 1. In these countries in the sterling area—England, Scotland, Ireland and India—how many new oil refineries have been built since the close of World War II?

a 4

b 6

c 8

d 12

QUESTION 2. How many of these refineries have been designed, engineered and constructed by Lummus?

a 3

b 5

c 7

d 9

ANSWERS: 1. *The answer is* (d)—*12 new refineries since the war, according to* World Petroleum *magazine.*

2. *Here* (b) *is correct. Lummus has built 5, or 42%, of the new refineries in these countries since World War II, through the Lummus Company Ltd. of London. These five refineries are for* Vacuum Oil Company *Limited at Coryton, England; California Texas Oil Corporation at Visakhapnam, India; Burmah-Shell Refineries, Ltd. at Bombay, India; Standard-Vacuum Oil Company, Ltd. at Bombay, India; and the Irish Refining Company, Ltd. at Whitegate, Ireland. Lummus Ltd. maintains a staff of over 400 specialists, and has engineered and constructed hundreds of process plants of all types and sizes in the sterling area from India to Ireland. Lummus Ltd. is one of seven international members of the Lummus group of companies which circles the globe. See Lummus on your next project.*

LUMMUS

ENGINEERS AND CONSTRUCTORS FOR INDUSTRY THROUGHOUT THE WORLD

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▶▶▶ New Equipment Section

This issue features . . .

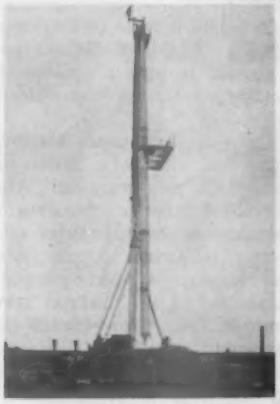
New d.c. rig-drive system

. . developed in Holland for use with diesel or gas-turbine prime movers promises increased flexibility. The Smit-Ring d.c. system is so designed that all generators and electric motors are connected in series in a closed loop. Any generator or motor not in use is automatically cut out of the loop without interrupting the functioning of other units.

The loop is always closed, either by the generator or motor armature, or by a contact of a special cutout switch. Thus a major advantage of the system for drilling-rig drive is that all prime-mover power is immediately available for any combination of power-consuming equipment, without causing interference. According to the maker, this system requires no special switching, thus simplifying operation.

Two rigs using the system are now undergoing field tests. All generators are connected in series. They are driven at constant speed by diesel engines. Speed regulation is obtained at the motors instead of at the generators. The total power required for

various services is evenly distributed by automatic balancing of the excitation over all of the generators in operation. Thus the generators need not be adapted to the power requirement of a particular motor. Instead, it is only necessary, according to the maker, to match the total installed generator capacity to the total power demand of the drilling rig. Source: **N. V. Electrotechnische Industrie Voorheen Willem Smit & Co., Slikkerveer, Holland.**



Drilling rig

. . . transports easily as it is designed so the components consist of transport packages. Made in Germany, the Type F-16 rig is assembled easily as the driving elements are connected by flexible shafts. The rig is capable of drilling to depths of 12,500 ft. with 3½-in. drill pipe.

For smooth operation, hydraulic torque converters are used. Two diesel engines rated at 440 hp. each power the draw works and pumps. A third diesel engine rated also at 440 hp. powers a standby pump.

The catworks and rotary table are driven either by a separate diesel engine rated at 330 hp. or, in the event of an emergency, by a hydraulic pump powered by the two 440-hp. draw works engines.

The working platform provides ample working space. The only stationary equipment on the platform are the rotary table, catworks, manifolds, and control panel.

The mast, a Salzgitter tubular type, has two legs and is designed to provide excellent visibility to the working and racking platform. Source: **Haniel & Lueg GMBH, 22a, Dusseldorf-Crafenberg, Germany.**

Aluminum pellets

. . . for fracturing of oil and gas wells recently developed can, according to the manufacturer, increase well production up to 250%. Called Frac-Shot, the aluminum pellets are said to resist some of the problems normally associated with fractures in highly permeable formations. The aluminum pellets deform slightly rather than being crushed. The resulting deformation increases the particles' bearing area against the formation wall which reduces the stress on the particle and its penetration into the formation. Source: **Reynolds Metals Co., Box 2346-ZA, Richmond, Va., U.S.A.**

Want more facts about equipment or copies of product literature described in this issue?

Send this Showcase Coupon

to manufacturer at address shown in bold type after each item.

Product name, Model no., literature title or number .....

.....

Described in OIL and GAS **JOURNAL - Issue of October 31, 1960**

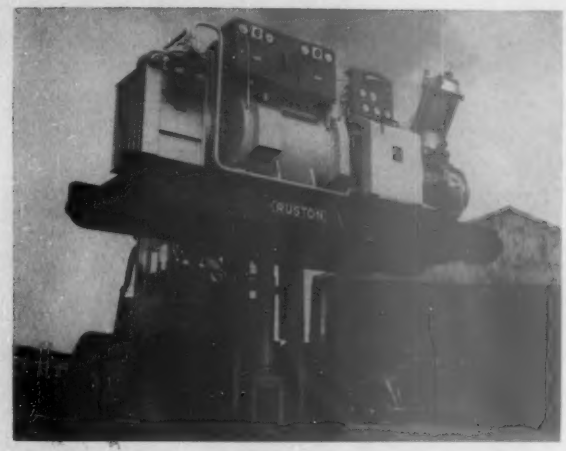
NAME..... **TITLE**.....

COMPANY.....

ADDRESS.....

CITY..... **STATE**.....

New Equipment



Gas turbine alternator on skids

. . . is available, from an English manufacturer, that is said to be easily moved from one site to another. The set incorporates a single-shaft gas turbine and develops 300 kw. at sea level in a maximum ambient temperature of 80° F.

All auxiliaries, including the filters, coolers, and turbine and alternator control gear, are built into one unit which can be put into operation soon after arrival at a new location. The only external connection needed is for the fuel supply. Source: **Ruston & Hornsby Ltd., Box 2, Lincoln, England.**

New rotary-wing aircraft

. . . on the market, a four-place unit, has a maximum gross weight of 3,100 lb. and an empty weight of 2,080 lb., is powered by a 270-hp, supercharged engine, and is certificated by the Federal Aviation Agency for cruising speeds to 122 m.p.h. Fuel capacity is 60 gal. Auxiliary tanks provide 30 gal. more. Together, these provide a maximum cruising range of 5.15 hours.

The Skyhook craft uses a two-blade metal lifting rotor in combination with a metal antitorque rotor located on the fuselage tail boom. Initially, the craft will be marketed in only visual-flight-rules version, though a unit for instrument-flight-rules operation has been certificated. Source: **Cessna Aircraft Co., Wichita, Kans., U.S.A.**

•

Notch jet tool for fracturing

. . . which is a modified sand jet tool designed for jobs that use the single-point-entry fracturing technique. The tool cuts a horizontal disk-shaped wedge into the formation.

The wedge or notch is subsequently used as the starting point for a fracture. The notch jet nozzles direct sand-laden fluid against the casing at an initial angle of 21° off center. This causes the fluid splashback to be directed away from the cutting stream. As penetration extends through the casing and cement, the angle of deflection reduces as the notch is extended into the formation. Source: **BJ Service, Inc., 6505 Paramound Blvd., Long Beach 5, Calif., U.S.A.**

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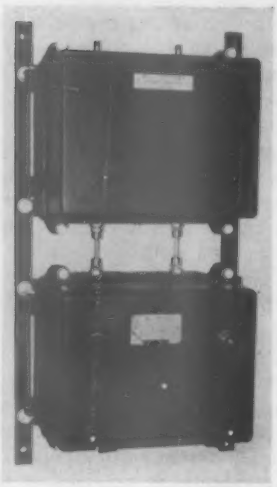

Industrial-oxygen analyzer

. . . is available from an English manufacturer. The Type DCL83 analyzer is claimed to give a number of outstanding advantages over older analyzers:

These include faster response because the sample flows directly through the measuring cell. Also it is said to give safer operation as no hot wires or high voltages come in contact with the sample. And the case is gastight and equipped with purge connections. Source: **Servomex Controls Ltd., Crowborough, Sussex, England.**

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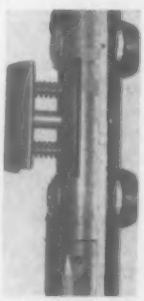
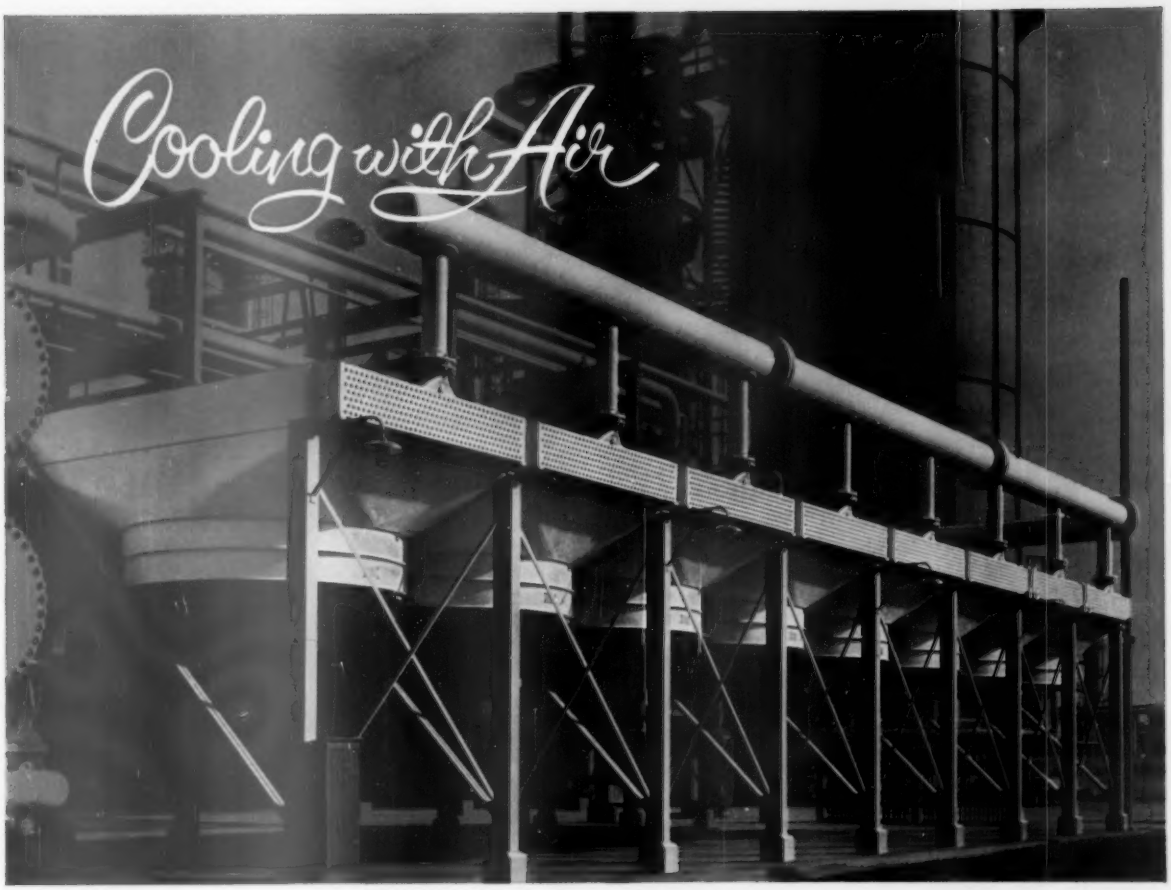
Wireline tester



. . . for formations has been developed to permit fast yet low-cost evaluation of cased-off sands. Called a formation-interval tester, the tool tests through two perforations spaced 8 in. apart and is applicable in casings measuring 5½ in. or larger.

Perforations are produced by shaped charges in the tool. According to the maker, the in-



IN THE BAYWAY REFINERY . . .

of the Esso Standard Division of Humble Oil and Refining Company.

The above pictured installation of HUDSON Solo-aire units obviated costly addition to the existent and comparatively high-maintenance-cost water system.

Over-all economic comparisons of HUDSON Solo-aire cooling versus water cooling almost invariably result in selection of Solo-aire units for much or all process cooling.

In two complete 40,000 barrel seaside refineries constructed abroad, Solo-aire units are used for ALL process cooling services. NO WATER IS USED FOR PROCESS COOLING.

In the United States in a 40,000 barrel refinery built adjacent to an unlimited water supply, 50% of the total dissipated heat is transferred directly to air through Solo-aire units.

Operating results of thousands of HUDSON Solo-aire units installed in oil, gas and chemical plants throughout the free world have established HUDSON leadership in the field of direct cooling with air.

ONLY HUDSON designs and manufactures ALL THREE categories of cooling equipment . . . for cooling solely with air (Solo-aire); for cooling primarily with air but with minimum water to obtain low effluent process stream temperatures (Combin-aire); and water cooling towers. Take advantage of HUDSON'S objective assistance in selecting the integrated cooling system which best balances capital investment and operating cost for the specific process, climatic, and water conditions.

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DIAMOND roller chains

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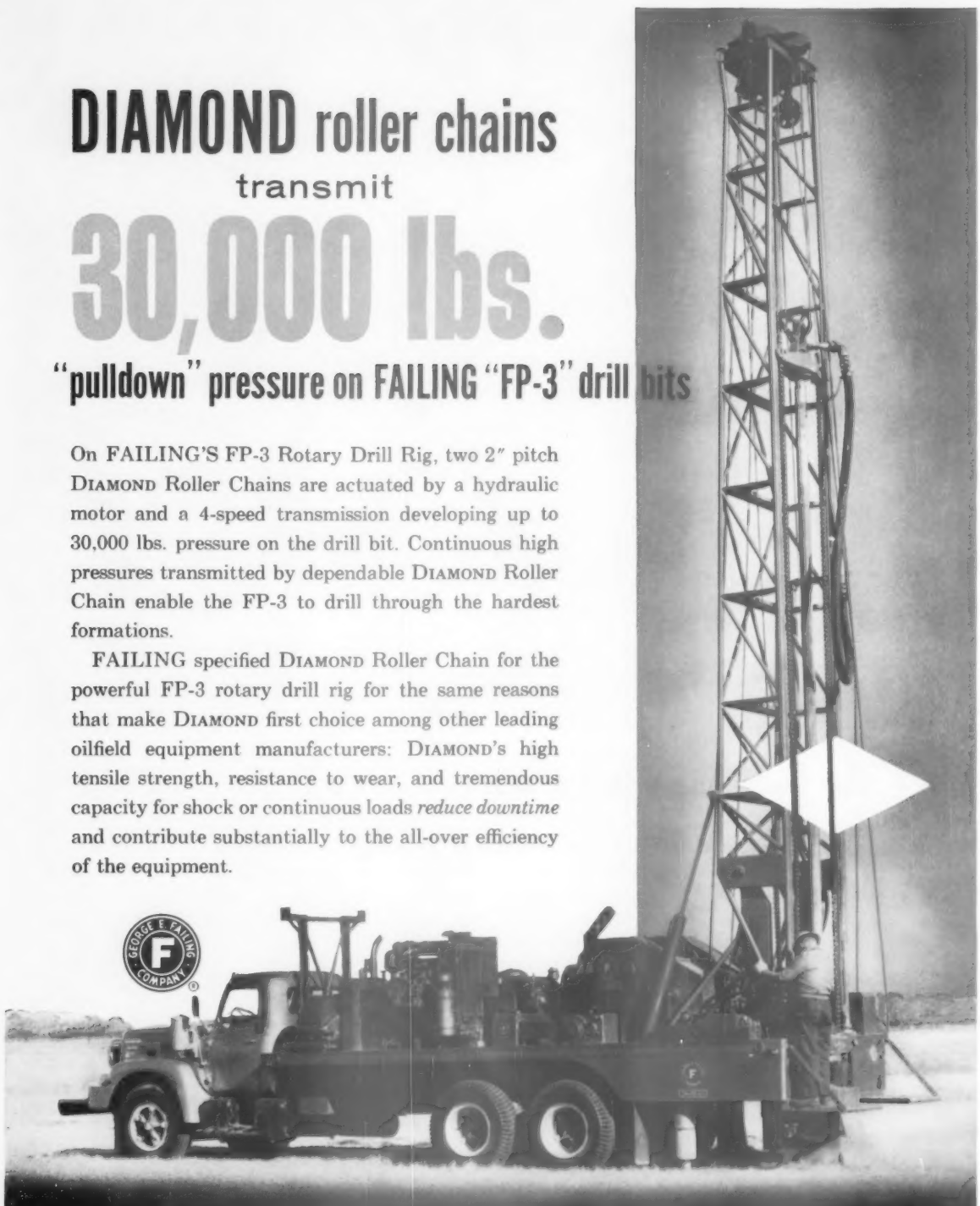
30,000 lbs.

"pulldown" pressure on FAILING "FP-3" drill bits

On FAILING'S FP-3 Rotary Drill Rig, two 2" pitch DIAMOND Roller Chains are actuated by a hydraulic motor and a 4-speed transmission developing up to 30,000 lbs. pressure on the drill bit. Continuous high pressures transmitted by dependable DIAMOND Roller Chain enable the FP-3 to drill through the hardest formations.

FAILING specified DIAMOND Roller Chain for the powerful FP-3 rotary drill rig for the same reasons that make DIAMOND first choice among other leading oilfield equipment manufacturers: DIAMOND'S high tensile strength, resistance to wear, and tremendous capacity for shock or continuous loads *reduce downtime* and contribute substantially to the all-over efficiency of the equipment.



Complete stocks of DIAMOND Roller Chains are available from your oilfield store . . . or consult the Yellow Pages of your phone book for the name of your nearest DIAMOND Distributor.

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DIAMOND ROLLER CHAINS ®

terval tester, with its two perforations, increases the flow rate into the tool in low-permeability formations and gives assurance that a poor test will not result from chance penetration of a single perforation into a thin impermeable streak within the formation. Source: **Schlumberger Well Surveying Corp., Box 2175, Houston, Tex., U.S.A.**

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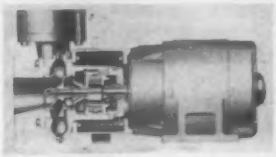

Centrifugal pump

. . . with primer built-in is now available for use in bulk station service, and other liquid-handling jobs where suction lifts are encountered and self-priming can be available. The Centri-Prime Mortorpump is said to combine the lifting capabilities of a self-priming pump with the high efficiency of a conventional centrifugal pump.

The pump is a single-stage, single-suction type. The priming unit is a positive-displacement type. On straight suction, the unit will prime up to 19 ft. total head, the maker says. The Model RVSW comes in ratings from 5 to 15 hp. Source: **Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y., U.S.A.**

●

Triangular derrick

. . . which telescopes recently developed is designed to provide, compared with older types, greater strength with less weight, and faster operating speed. The Tri-Scope derrick has a triangular cross-section and closed triangular bracing in all derrick faces.

The crown is positioned on the derrick so all three legs are working legs. The standard crown provided on the derrick allows a four-line string-up to the block without crossing lines. This is achieved with the use of an offset sheave on the back side of the crown. This arrangement is said to eliminate block twist also.

The 90-ft. derrick has a 100,000-lb. capacity. Roading length is 56 ft. Source: **Cabot Corp., Machinery Div., Pampa, Tex., U.S.A.**

●

Drilling shock

. . . may be reduced with a new tool now available which can be run between the drill collars and the bit. The shock absorber is designed to prevent rough running of the drilling string by preventing bit vibrations from traveling up the drill-collar string.

The tool is made by bonding rubber between two cylindrical members. This rubber absorbs shock loads from the bit. The tool is being built for hole sizes from 7⅞ to 17½ in. Source: **Drilco Oil Tools, Inc., Drawer 3135, Midland, Tex., U.S.A.**

HILLMAN-KELLEY

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Hydraulic **POWER TUBING TONG***

Hydraulic **POWER CASING TONG***

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Petroleum Storage Tank, Clyde Refinery, Photograph by courtesy of The Shell Refining (Australia) Pty. Ltd.

International Paints

for the oil and petro-chemical industries

International paints for the oil industry provide protection against the searing heat of the sun, the fierce bite of sandstorms and the insidious reaction of fume-laden atmospheres—all conditions which exist wherever oil is found. Group 37—an Epoxide resin based paint—is just one of the tough, outstandingly successful paints from the comprehensive International range. It is featured here on the inside of a storage tank where it gives protection against most modern additives and the corrosive effects of fuel vaporisation.

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A World-wide Paint Organisation with 25 factories throughout the world.

Rubber expansion joints

. . . developed by a Netherlands manufacturer offer a way to absorb expansion and contraction in piping caused by temperature changes as well as to insulate the joints against electric current flow.

The joints are available in both low and high-pressure units that can be used in existing pipelines as well as in new ones, allowing for soil settlement, insulation of electric current, and deadening of sound.

The rubber joints resist sea water, oil, acids, and alkali solutions. Equipped with a rubber flange, the joints also can serve as gaskets or seals between pipe sections. They come in diameters to 80 in. Lengths range from about 6 in. for small diameters to 16 in. for large diameters. Source: **Vredestein International, The Hague, Netherlands.**

Internal-lineup clamp

. . . for pipe uses double rollers to provide contact points and to minimize friction between the clamp and the pipe. The clamp has individually operated pneumatic heads designed to bring distorted or out-of-round pipe into a circle, to align pipe joints center, and to distribute any pipe-diameter differences uniformly around the circumference of the pipe.

The clamp is pulled through pipe by use of a large-diameter ball-bearing-equipped wheel. Plastic wheels are available for use with internally coated pipe. The clamp comes in four sizes for pipe diameters of 20 to 36 in. Source: **Crose-Perrault Equipment Co., Box 3368, Tulsa, Okla., U.S.A.**

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BLOWOUT PREVENTER

Holds to 3,000 psi against all diameters 0″ to 1½″. Prevents blowouts when you pull rods or replace stuffing box rubbers.

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New Literature

Pumping-unit

. . . selection guide just issued, concerns itself with beam-and-crank counterweighted pumping units. Ten-page Bulletin 518 gives tabular data on each model and combination of specifications, including a range of maximum counterweight effects from 2,571 to 27,500 lb., and strokes of 16 to 120 in. Source: **National Supply Co., Two Gateway Center, Pittsburgh 22, Pa.**

•

Refrigerated storage facilities

. . . for liquefied-petroleum gases, according to a newly published literature piece, result in greater efficiency, lower cost, superior safety features, and no construction problems by using CB&I's turnkey service. The eight-page brochure offers advantages of refrigerated storage methods, and informative text. Source: **Chicago Bridge & Iron Co., 332 South Michigan Ave., Chicago 4, Ill.**

•

Chart integrator

. . . bulletin just published, provides details for interpretation of the maker's strip charts and conventional round charts. The chart integrator is said to not only compute the chart extension for differential and static pressure, but also to provide readout values for the average absolute static pressure and the average differential pressure. Source: **American Meter Co., 920 Payne Ave., Erie, Pa.**

•

Fluid-loss additive, cement

. . . called FLAC, is the topic of a new available 32-page technical report. It offers descriptions, advantages, suggested uses, field applications, and laboratory data. Nineteen pages of graphs and tables are included. Source: **Dowell Division of The Dow Chemical Co., Box 536, Tulsa, Okla.**

•

Folder lists gages, thermometers

. . . instruments, and controls in six pages. The literature presents 10 bourdon-type pressure gages which cover a variety of industrial applications. Included are photographs along with information on dimensions, accuracies, construction features, and suggested uses. Bulletin 3020 also offers dial and glass-tube thermometers and panel-type and multiangle thermometers. Photos show different models with text covering data on construction, dimensions, ranges, and uses. Control instruments included are indicating controllers, valve positioner and pilot options, recorders, chemical attachments, and accessories. Source: **U. S. Gauge Div., American Machine & Metals, Inc., Sellersville, Pa.**

Chemical demulsifiers

. . . for petroleum producers are discussed in an available 16-page brochure which describes various applications of Tret-O-Lite chemical demulsifiers. Photographs, photomicrographs, charts and other illustrations supplement the booklet in describing uses, types of emulsions, and demulsifiers. The brochure includes a schematic drawing depicting how more than 30 factors in a normal production system may affect treating efficiency and treating costs. Source: **Tretolite Co., 369 Marshall Ave., St. Louis 19, Mo.**

Centrifugal pipeline compressors

. . . Bulletin 187 details mechanical and hydraulic design considerations for the two-stage compressors. The 12-page publication is complete with charts, diagrams, and calculating formulas. Source: **Clark Bros. Co., Olean, N. Y.**

Catalog for process industries

. . . just announced, contains 20 pages of data on tank cars, custom fabrication, field erection, tank-storage terminals, gasholders, mixing devices, dryers, Kanigen nickel alloy coating, plastics molding, and research and development. Source: **General American Transportation Corp., 135 S. LaSalle St., Chicago 90.**

Stainless-steel tubing publication

. . . shows cutaway views of tubing, while charts give size ranges, analyses, and tolerances of stainless steel. Information is included on testing facilities which perform pressure, tension, ultrasonic, eddy current, hardness, flattening, flaring, flanging, dye penetrant, microinch finish, bending, and other tests. Source: **Columbia Steel & Shafting Co., Pittsburgh 30, Pa.**

How to size a fluid filter

. . . is told in a new 12-page bulletin containing flow curves showing pressure drop based on various flows through different filter elements. The publication tells how to select a filter to achieve desired particle retention, taking into consideration viscosity of the fluid and the flow in gallons per minute regardless of system pressure. Source: **Rosaen Co. 1776 E. Nine Mile Road, Hazel Park, Mich.**

Heat-transfer equipment digest

. . . lists double-pipe heat exchangers, fired indirect heaters, tank heaters, tank suction and line heaters, process heaters and coolers, gas cooling and heating equipment, and special custom-built heating and cooling equipment. To acquaint you with advantages of using finned tubes in heat-transfer products, Bulletin 800 explains thermal and mechanical advantages, plus a method of manufacturing that results in an integral fintube which is said to have no possibility of a fouling factor. Source: **Brown Fintube Co., 300 Huron St., Elyria, Ohio.**

Corporate brochure

. . . of Ernest F. Fullam, Inc., introduces you to services and consulting work carried on by this Schenectady, N. Y., firm. The publication deals with research and development, laboratory facilities, electron, X-ray, and light microscopy, diffraction, X-ray spectrography, microprobe, and instrument and phototype-machine development. Source: **Ernest F. Fullam, Inc., Box 444, Schenectady 1, N. Y.**

Diesel-fuel additive

. . . known as OFA 265, an ashless detergent for keeping diesel injectors clean, is detailed in a new 22-page brochure. A six-page supplement can also be obtained which gives additional details and statistics gathered in field testing. The literature outlines properties of the fuel additive and includes data on blending, storage, toxicity, concentrations, etc. Source: **Oronite Chemical Co., 200 Bush St., San Francisco, Calif.**

New Literature

Two-way-radio

. . . booklet contains explanations and illustrations of the benefits made possible through the incorporation of transistors in the new Motrac radio. Among the advantages described are low current drain, compactness, reduced maintenance, and high audio power. A special section is devoted to research and engineering of a new series of radios. Source: **Motorola, Inc., 4501 W. Augusta Blvd., Chicago 51, Ill.**

Compressors

. . . are described in new four-page Brochure 98 which gives the operating characteristics of 4,000-hp. JM compressors. The literature also describes En-Tronic controls which can make the JM unit into a completely automatic system which starts itself, shuts itself down, or operates fully unloaded. The illustrated brochure contains a cutaway model of the entire unit showing internal mechanisms, a page of charts and diagrams, along with complete specification tables. Source: **Cooper-Bessemer Corp., Mount Vernon, Ohio.**

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Rotary-selector valve bulletin

. . . recently published, outlines various features and applications. The valve is said to replace normal headers in applications such as manifolding, metering, testing, gathering, tank-switching, water flooding, and product routing. The literature includes an exploded view of the valve along with a listing of available models and sizes. Source: **Continental-Emsco Co., Box 359, Dallas 21, Tex.**

•

Plastic valves

. . . and fittings available in corrosion-resistant polyvinyl chloride are discussed in a new bulletin, yours upon request. It features a comprehensive four-page application table that rates PVC effectiveness on over 300 fluids. Another section gives illustrated descriptions and dimensions of PVC valves Y-globe, check, bleeder, and diaphragm, strainers, unions, fittings, and expansion joints. Source: **Walworth Co., 750 Third Ave., New York 17, N. Y.**

•

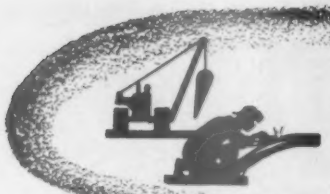
Heat-transfer equipment catalog

. . . covers radiators, heat exchangers, supercharger air coolers, industrial and oil-field equipment and heating, and air-conditioning products. Catalog 160 (32 pages) offers a presentation of scientific, nuclear-heat-transfer applications stressing technical research developments. Source: **Young Radiator Co., Racine, Wis.**

•

Diesel generator

. . . sets for standby and continuous off-the-line power are illustrated in eight-page Form 8SA68, free for the asking. It contains charts showing technical data on generator sets from 13.5 to 260 kw. Technical data includes: (1) maximum kw. and kva. ratings; (2) information and model numbers for radiator-cooled and heat-exchanger-cooled sets; and (3) engine data for three series, including twins and "V" engines as well as in-line models. Source: **Detroit Diesel Engine Div., General Motors Corp., 13400 West Outer Drive, Detroit 28, Mich.**



Monthly Report on PIPELINE CONSTRUCTION

PIPELINE ACTIVITY reported here is compiled from surveys by The Oil and Gas Journal among pipeline companies and construction contractors.

This summary report appears in the last issue of the Journal each month. New construction projects are reported weekly in Pipeline Briefs in the Journal's news section.

Projects are listed in three groups—U. S., Canadian, and Foreign—and according to type of line—crude, products, or natural gas.

★ The star symbol indicates the first appearance of the project in the Journal's survey.

U. S. Crude Oil Pipelines

BELLE FOURCHE PIPELINE CO., Box 1612, Casper, Wyo.
Project: 103-mile 8-in. line from Fiddler Creek field to Lance Creek, Wyo., and other lines to serve Roset, Miller Creek, and Lone Tree fields.
Status: Approved by Wyoming Public Service Commission.

CAPE PIPE LINE CO. (Sun Oil Co., Cities Service Co., Atlantic Refining Co.), Philadelphia.
Project: Line from lower Delaware Bay to Philadelphia.
Status: Proposed.

CONTINENTAL PIPE LINE CO., Drawer 1267, Ponca City, Okla.
Project: 21 miles of 8-in. from Grand Isle to Golden Meadow, La.
Completion: December 15, 1960.

GILLETTE PIPELINE, INC., and A. W. HARTWIG, INC.
Project: A 102-mile line from Dead Horse Creek field to Casper, Wyo.
Status: Pending Wyoming Public Service Commission approval.

GREAT NORTHERN RAILWAY, St. Paul.
Project: About 64 miles from Lignite field, Burke County, North Dakota, to Minot.
Status: Planned.
Completion: 1961.

GULF REFINING CO., Drawer 2100, Houston 1, Tex.
Project: 23 miles of reroute of 10-in. near Carlyle, Ill.
Completion: December 1960.

INTERNATIONAL OIL PIPELINE CORP., New York.
Project: Would own U. S. section of 1,500-mile, 30-in. line proposed by Mid-Continent Pipe Lines, Ltd., from Edmonton, Alta., to Chicago. (See Canada).
Status: Proposed.

INTERNATIONAL REFINERIES, INC., 227 North Colfax Ave., Minneapolis 5, Minn.
Project: 3½ and 4½-in. gathering lines in Wiley and Bottineau fields, North Dakota.
Status: Approved by state authorities.

MATADOR PIPE LINE CORP., Denver.
Project: 175-mile line from Burke, Bottineau, and Renville counties, North Dakota, to Cromer, Man.
Status: Pending approval of Canadian National Energy Board.

NORTHWESTERN REFINING CO., Box 248, St. Paul Park, Minn.
Project: 4, 6, and 8-in. gathering lines in Glenburn field, Renville and Bottineau counties, North Dakota.
Status: Has state approval.

TETON PIPE LINE CORP., 1700 Broadway, Denver 2, Colo.
★ Project: 67 miles of 6 or 8-in. connecting Badger Creek and Dead Horse Creek fields with terminal facilities in Salt Creek field, Wyoming.
Status: Pending Wyoming Public Service Commission approval.

U. S. Products Pipelines

CALNEV PIPE LINE CO. (owned principally by Union Pacific Railroad Co., Union Pacific Building, Omaha, Neb.).
★ Project: 212 miles of 8-in. and 13 miles of 6-in. from Colton (near Los Angeles) to Las Vegas, Nev. The 225-mile line will carry gasoline, diesel fuel, and jet fuel, serving Victorville and Barstow, Calif., and Nellis Air Force base in Nevada.
Status: Under way.
Contractor: Williams Brothers, Tulsa, Okla.
Completion: March 1, 1961.

MID-AMERICA PIPELINE CO., Skelly Building, Tulsa, Okla.
Project: 2,300-mile LPG system from West Texas-New Mexico area to upper Midwest. Size of pipe 8 and 10-in., with branches 4 to 8-in.
Status: Under way.
Contractor: Williams Brothers Co., Tulsa, is turnkey contractor. Subcontract for 4 to 8-in. line from Artesia, N. M., to Midkiff, Tex., awarded to McVean & Barlow, Odessa, Tex.
Completion: December 1960.
★ Project: 405-mile, 10-in. condensate line from Superior, Wis., to Chicago. The line would connect at Superior with the trunk line of Lakehead Pipe Line Co., eastern division of Interprovincial Pipe Line Co. Shipments would be fed into Interprovincial from gathering lines in Alberta now under consideration.
Status: Proposed.

NEW HAVEN PIPELINE, INC., 515 Madison Ave., New York 22, N. Y.
Project: 12-in. line from New Haven to Hartford, Conn., and 10-in. from there to Springfield, Mass., with a 6-in. spur to Westover Air Base at Ludlow, Mass.
Status: Proposed.

SIBON PIPE LINE CO., Houston.
Project: Mississippi River crossing consisting of three 6-in. products lines near White Castle, La.
Status: Under way.
Contractor: Houston Contracting Co.

SOHIO PIPE LINE CO., Guildhall Building, Cleveland 15, Ohio.
Project: 3 miles of 6-in. from the Dayton terminal to Wright-Patterson Air Force Base.
Completion: November 15, 1960.

TEXAS EASTERN TRANSMISSION CORP., Box 1189, Houston. (Jointly with Buckeye Pipe Line Co.)
Project: 90-mile extension of Little Big Inch from Lebanon to Lima, Ohio.
Status: Under way.
Contractor: Shamrock Construction Co., Lansing, Mich.
Completion: November 15, 1960.
Project: 10 miles of 10-in. from Baytown to Mont Belvieu, Tex.
Completion: November 1960.

TRANS-SOUTHERN PIPELINE CORP. (subsidiary of Transcontinental Gas Pipe Line Corp., Box 296, Houston).
★ Project: 1,080 miles of 4 to 12-in. LPG line from Mont Belvieu, southeast of Houston, to Danville, Va., and 275 miles of 6-in. spurs, including 215 miles from Atlanta to Waycross, Ga., 25 miles from Linden to Demopolis, Ala., and 35 miles from Laurel to Hattiesburg, Miss.
Status: Planned, with target date for start of construction April 1961.
Completion: By November 1, 1961.

WEST SHORE PIPELINE CO. (Stock owned by Pure Oil Co. and Interstate Oil Pipe Line Co., a subsidiary of Standard Oil Co. of New Jersey).
Project: 200-mile line from Chicago to Milwaukee and Green Bay, Wis., with main line possibly 16-in. and laterals 12-in.
Status: Proposed. The line has backing of 10 oil companies.

YELLOWSTONE PIPE LINE CO., Drawer 1267, Ponca City, Okla.
Project: 82 miles of 6-in. from Helena to Great Falls, Mont.
Status: Under way.
Contractor: R. H. Fulton & Co., Lubbock, Tex.
Completion: November 25, 1960.

U. S. Natural Gas Pipelines

ALASKA PIPE LINE CO., Houston, Tex.
Project: 82 miles from Kenai Unit gas field to Anchorage.
Project: Extension of Kenai-Anchorage line to Fairbanks.
Status: Alaska Pipe Line Co. has ordered economic and engineering studies to determine feasibility of such a proposal.

ALGONQUIN GAS TRANSMISSION CO., 25 Faneuil Hall Square, Boston 9, Mass.
Project: 30 miles of line in Massachusetts.
Status: Approved by FPC.

AMERE GAS UTILITIES CO., Box 1273, Charleston, W. Va.
★ Project: 16½ miles of 10-in. from Carbon to Elkview, W. Va.
Contractor: Harford Brothers, Emporium, Pa.
Completion: November 25, 1960.

PIPELINE CONSTRUCTION

ARKANSAS INDUSTRIAL PIPELINE CORP. (Arkansas Louisiana Gas Co.), Shreveport.
Project: 130 miles of 18-in. from Perla to Helena, Ark.
Contractor: Pentzien, Inc., Omaha, has contract for dual crossing on the Arkansas River near Wright.
Completion: Fall 1960.

ARKANSAS LOUISIANA GAS CO., Shreveport.
Project: About 58 miles of 2, 3, 4, and 6-in. line in various locations.
Completion: 1960.

ARKANSAS WESTERN GAS CO., Box 405, Fayetteville, Ark.
Project: New lines from Altus, Coal Hill, and Rock Creek fields to the main system.
Status: Approved by Arkansas Public Service Commission.

BORDER GAS TRANSMISSION CORP. (owned by Lehman Brothers, New York investment firm, and Rio Gas Gathering Co., 615 National Bank of Commerce Building, San Antonio 5, Tex.).
Project: Gathering lines in Starr, Zapata, Jim Hogg, Brooks, and Webb counties, Texas.
Status: Proposed.
Project: Gathering lines in Dimmit, Zavala, and La Salle counties, Texas.
Status: Proposed.

CENTRAL ILLINOIS LIGHT CO., 300 Liberty St., Peoria 2, Ill.
Project: 34 miles of 30-in. in the Peoria, Ill., area.
Status: Under way.
Contractor: Somerville-Illinois Co., Peoria.
Completion: November 30, 1960.

CENTRAL ILLINOIS PUBLIC SERVICE CO., 607 East Adams St., Springfield, Ill.
Project: 20 miles of 10-in. from the Tuscola area to the Mattoon and Charleston areas.
Completion: Fall 1960.

COASTAL STATES GAS PRODUCING CO., 200 Petroleum Tower, Corpus Christi, Tex. (Subsidiaries include La-Vaca Gathering Co. and South Texas Natural Gas Gathering Co.).
Project: 330 miles of various size pipe from Three Rivers area to southeast Lavaca County, Texas.
Completion: April 1, 1961.
Project: 27 miles of 8 and 33 miles of 6-in. from southeast La Salle County to the Pearsall, Tex., area.
Status: Under way.
Contractors: Jess Edwards, Inc., Corpus Christi, and Adair Pipeline Co.
Completion: December 1, 1960.

COLORADO INTERSTATE GAS CO., Box 1087, Colorado Springs.
Project: 7 miles of 20-in. in Texas Panhandle.
Status: Pending FPC approval.
Completion: 1960.
Project: 109 miles of 26-in. from Texas Panhandle to southeastern Colorado; 134 miles of 34-in. from there to Pueblo, and 107 miles of 30-in. on to Denver; 155 miles of 34-in. from Green River, Wyo., to Provo, Utah.
Status: Approved by FPC examiner.
Completion: 1960.
Project: 32 miles of 6-in. from Central Colorado to Trinidad.
Status: Pending FPC approval.
Completion: 1960.

COLORADO OIL & GAS CORP., Denver.
Project: 402-mile line from Gubik field to Fairbanks, Alaska.
Status: Proposed.

COLUMBIA GULF TRANSMISSION CO., Box 683, Houston, Tex.
Project: 6 miles of 24 and 30-in. at Mississippi River crossing near Providence, La.
Status: Under way.
Completion: November 15, 1960.

EL PASO NATURAL GAS CO., Box 1492, El Paso, Tex.
Project: 119 miles of 30-in. Permian-San Juan crossover loop.
Status: Pending FPC approval.
Completion: 1961.
Project: 13 miles of 20-in. loop on the Goldsmith-Plains line.
Status: Pending FPC approval.
Completion: Not known.
Project 51 miles of 20-in. from Terrell to Puckett, Tex.
Status: Temporarily approved by FPC.
Contractor: Western Pipe Line Construction Co.
Completion: Fall 1960.
Project: 17 miles of 30-in. near Spokane, Wash.
Status: Pending FPC approval.
Completion: Not known.
Project: 17 miles of 8-in. in the Klamath Falls, Ore., area.
Status: Pending FPC approval.
Completion: Fall 1960.
Project: About 121 miles of 10 to 20-in. line from mainline in Oregon to Portland and Eugene.
Status: Temporarily approved by FPC.
Contractor: Hood-Rivers Associates.
Completion: Fall 1960.
Project: Permian-San Juan crossover loop, involving 119 miles of 30-in.
Status: Pending FPC approval.
Completion: 1961.
Project: 34 miles of 20-in. from Puckett tie-in to Goldsmith, Tex.
Status: Pending FPC approval.
Completion: 1961.
Project: 23 miles of 20-in. from Goldsmith to the Eunice-Plains line, and 395 miles of 34-in. from Thistle, Utah, to near Las Vegas, Nev.
Status: Pending FPC approval.
Completion: 1961.
Project: Loop on the San Juan mainline, involving 27½ miles of 34-in.
Status: Pending FPC approval.
Completion: Not known.
Project: About 228 miles of 30-in. from Coquat to Sonora, Tex.
Status: Pending FPC approval.
Completion: Not known.

EQUITABLE GAS CO., 420 Boulevard of the Allies, Pittsburgh, Pa.
Project: 15 miles of 16-in. in Monongalia County, West Virginia, and Greene County, Pennsylvania.
Status: Approved by FPC.
Completion: October 1961.
Project: 6 miles of 20-in. in Greene County, Pennsylvania.
Status: Approved by FPC.
Completion: October 1961.
Project: 17 miles of 20-in. in Greene and Washington counties, Pennsylvania.
Status: Approved by FPC.
Completion: October 1962.

HOUSTON TEXAS GAS & OIL CORP., Box 10400, St. Petersburg 33, Fla.
Project: 235 miles of 2 to 6-in. lateral lines.
Status: Pending FPC approval.
Completion: January 1, 1961.

IOWA-ILLINOIS GAS & ELECTRIC CO., 206 East 2 St., Davenport, Iowa.
Project: 25 miles of 4 and 6-in. line north of Muscatine, Iowa.
Status: Under way.
Contractor: Midwestern Contractors, Inc., Wheaton, Ill.

IRON RANGES NATURAL GAS CO., St. Paul.
Project: 79 miles of 10 and 12-in. from Grand Rapids to Hoyt Lake, Minn., and 67 miles of 12-in. from Duluth to Silver Bay, Minn.
Status: Approved by FPC.
Completion: 1960.

KANSAS GAS SUPPLY CORP.
★ Project: 105 miles of 4 to 16-in. in Kansas, with spread location at Pratt.
Status: Under way.
Contractor: Vaughn & Taylor Construction Co., Inc., Odessa, Tex.
Completion: November 15, 1960.

LO-VACA GATHERING CO. (see parent company, Coastal States Gas Producing Co.)

MANUFACTURERS LIGHT & HEAT CO., Union Trust Building, Pittsburgh 19, Pa.
★ Project: 10½ miles of 24-in. in Washington and Beaver counties, Pennsylvania.
Status: Planned.
Completion: September 1961.
★ Project: 7 miles of 4 to 12-in. in the Victoria storage field, Marshall County, W. Va.
Contractor: Felmont Oil Corp.
Completion: March 1961.

MICHIGAN CONSOLIDATED GAS CO., 415 Clifford St., Detroit 26, Mich.
Project: 47 miles of 30-in. from Elsie to Sixlakes, Mich.
Status: Under way.
Contractor: Williams Brothers Co., Tulsa.

MICHIGAN WISCONSIN PIPE LINE CO., 500 Griswold Street, Detroit 26, Mich.
Project: 26 miles of 6 and 8-in. in Wisconsin.
Status: Approved by FPC.
Project: 15 miles of 4-in. in Michigan.
Status: Approved by FPC.
Projects: 342 miles of 24-in. and 191 miles of 30-in. in Kansas, Iowa, Illinois, Michigan, and Indiana.
Status: Approved by FPC.
Contractors: R. H. Fulton & Co., Lubbock, Tex.; Bechtel Corp., San Francisco; Majestic Contractors, Inc., Houston; and Somerville Construction Co., Ada, Mich.
Completion: November 1960.
Project: 92 miles of 20 and 24-in. from Appleton to Marshfield. Wis.
Status: Under way.
Contractor: Houston Contracting Co.
Completion: November 1960.
Projects: 86 miles of 16-in. and 38 miles of 4-in. in Wisconsin.
Status: Approved by FPC.
Contractor: Harbert Construction Corp., Birmingham, Ala.
Completion: November 1960.
Project: 111 miles of 4, 6, and 8-in. in Wisconsin.
Status: Approved by FPC.
Contractor: Panama-Williams Corp., Houston.
Completion: November 1960.
Project: 31 miles of 4 and 6-in. in Wisconsin.
Status: Approved by FPC.
Contractor: R. H. Fulton & Co., Lubbock, Tex.
Completion: November 1960.
Project: 42 miles of 4 and 6-in. in Iowa.
Status: Approved by FPC.
Contractor: Vedal Pipe Line Construction Co., Mount Vernon, Ill.
Completion: November 1960.

MISSISSIPPI RIVER FUEL CORP., 407 North 8th Street, St. Louis 1, Mo.
Project: 5 miles of 16-in. and 15 miles of 12-in. from Collinsville, Ill., to St. Jacob, Ill.
Status: Pending FPC approval.

MISSISSIPPI RIVER TRANSMISSION CORP. (Mississippi River Fuel Corp.), St. Louis.
Project: 94 miles of 18-in. from Johnsonville, Ill., to the St. Louis area.
Status: Pending FPC approval.

PIPELINE CONSTRUCTION

MUSTANG FUEL CORP., affiliate of Oklahoma Resources Development Co., Cameron Building, Oklahoma City.
Project: About 170 miles of 12-in. trunk line from Oklahoma City to Harrah and Muskogee, Okla., and about 130 miles of 4 to 12-in. lateral in Central Oklahoma.
Contractors: Sadler Brothers Pipeline Construction Co. and Montin-Harbert Pipe Line Construction Co., both of Oklahoma City.
Completion: Fall 1960.

NATURAL GAS PIPELINE CO. OF AMERICA, 122 South Michigan Avenue, Chicago.
★ Project: 4 miles of 4-in. lateral to Belvidere station and 3 miles of 3-in. to Princeton station in Illinois.
Contractor: M. L. Hulcher Co., Inc., Virden, Ill.
Completion: By December 1, 1960.
Projects: 188 miles of 24-in. loop in Kansas and Oklahoma and 95 miles of 36-in. in Iowa.
Contractors: R. H. Fulton & Co., Lubbock, Tex., and River Construction Corp., Fort Worth.
Completion: By November 26, 1960.

OLD OCEAN FUEL CO. (subsidiary of Texas Electric Service Co.). Fort Worth.
Project: 364 miles of 12, 16, 20, and 24-in. from Gulf Coast south of Houston to the Fort Worth area.
Status: Under way.
Contractors: H. B. Zachry Co., San Antonio, Tex., and O. R. Burden Construction Corp., Tulsa, Okla.
Completion: December 1960.

PACIFIC GAS & ELECTRIC CO., 245 Market St., San Francisco.
Project: 9 miles of 12-in. from Berenda Creek to Chowchilla, Calif.
Contractor: Company crews.
Completion: 1960.
Project: 8 miles of 16 and 2 miles of 10-in. Fresno reinforcement.
Contractor: Company crews.
Completion: 1960.
Project: 7 miles of 16-in. from Ignacio to Petaluma, Calif.
Contractor: Company crews.
Completion: 1960.
Project: 67 miles of line from Kettleman Hills to Morro Bay, Calif.
Project: 120 miles of 34-in. looping of Topock-Milpitas main line.
Status: Planned. Pending FPC approval.
Completion: 1961.
Project: 11 miles of 20-in. from Pittsburg to Walnut Creek, Calif.
Contractor: Using company crews.
Completion: 1960.
Project: 291 miles of 36-in. from the California-Oregon border to Antioch, Calif. (Part of a 1,400-mile project to move Alberta gas to San Francisco.)
Contractor: H. C. Price Co., Bartlesville, Okla. (Bechtel Corp. San Francisco, is the engineering manager.)
Completion: System will be in use during 1961-62 winter season.

PACIFIC GAS TRANSMISSION CO. (Pacific Gas & Electric Co., San Francisco).
Project: 611 miles of 36-in. from the Canadian border at Eastport, Idaho, to the California border near Klammath Falls, Ore. (Part of a 1,400-mile project to move Alberta gas to San Francisco.)
Contractors: Western Pipe Line, Inc., Austin, Tex., and J. P. Neill & Co., Dallas, have contracts for the 465-mile southern portion. H. C. Price Co., Bartlesville, Okla., has contract for the 146-mile northern portion from Rosalia, Wash., to Eastport, Idaho. (Bechtel Corp., San Francisco, is the engineering manager.)
Completion: The system will be in use during the 1961-62 winter season.

PANHANDLE EASTERN PIPE LINE CO., 1221 Baltimore Avenue, Kansas City, Mo.
Project: 50 miles of 22-in. and 150 miles of 24-in. from Haven, Kans., to Elk City, Okla.
Status: Pending FPC approval.
Completion: December 31, 1960.
Project: 300 miles of 30-in., 18 miles of 26-in., 9 miles of 12-in., 29 miles of 8-in., and 40 miles of 6-in. loop.
Status: Pending FPC approval.
Completion: December 31, 1960.
Project: 141 miles of 4 to 16-in. gathering line.
Contractor: Hall Construction Co., Liberal, Kans.
Completion: December 31, 1960.

PEOPLES GAS LIGHT & COKE CO., 122 South Michigan Avenue, Chicago 3, Ill.
Project: 29 miles of 36-in. in the Chicago area.
Status: One portion under way.
Completion: 1960-62.

PEOPLES GULF COAST NATURAL GAS PIPELINE CO., 122 South Michigan Avenue, Chicago 3, Ill.
Project: 371 miles of 30-in. loop of present system between Texas and Chicago.
Status: Under way.
Contractors: Stanley-Bledsoe Corp., Tulsa; O. R. Burden, Tulsa; H. C. Price Co., Bartlesville, Okla.; River Construction Corp., Fort Worth; Panama-Williams Corp., Houston; and Sharman, Allen, Gay & Taylor, Inc. Houston.
Completion: December 21, 1960.
★ Projects: 44 miles of 6 and 8-in. laterals in Aransas and Refugio counties, Texas.
Completion: December 21, 1960.

PEOPLES NATURAL GAS CO., Two Gateway Center, Pittsburgh 22, Pa.
Project: 2½ miles of 12-in. near Wall station, Pennsylvania.
Status: Under study.
Projects: 10 miles of 12 and 20-in. in Pennsylvania.
Status: Preliminary work and right-of-way acquisition in progress.
Completion: November 30, 1960.

PIONEER NATURAL GAS CO., Amarillo.
Project: 21 miles of 12-in. from Sudan to Muleshoe, Tex.
Status: Pending FPC approval.
Project: 12 miles of 10-in. from Muleshoe, Tex. northward.
Status: Pending FPC approval.

PUBLIC SERVICE CO. OF NORTH CAROLINA, Gastonia, N. C.
Project: About 47 miles of 4, 8, and 10-in. in North Carolina.

RIO GRANDE VALLEY GAS CO., Box 391, Brownsville, Tex.
Project: 60 miles of 12-in. in Hidalgo, Starr, and Jim Hogg counties from Moore field area to Prado field area, replacing and reconditioning existing line.
Status: Planned.
Completion: 1961.
Project: 5 miles of 6-in. from Moore field area to North Monte Christe field, Hidalgo County.
Contractor: Own forces.
Completion: December 1960.
Project: 3½ miles of 12-in. in South Weslaco field area, Hidalgo County.
Contractor: Own forces.
Completion: December 1960.

ROCKY MOUNTAIN NATURAL GAS CO.
Project: 65 miles of gas line in southwestern Colorado to supply Collbran, Montrose, Delta, and Orchard City.
Status: Under way.
Contractor: H. C. Price Co., Bartlesville, Okla.
Completion: Fall 1960.

SAN DIEGO GAS & ELECTRIC CO., Box 1831, San Diego 12, Calif.
Project: 51 miles of 30-in. from the Rainbow meter station to San Diego.
Status: Under way.
Contractor: Stanley-Bledsoe Corp.

SOUTHERN CALIFORNIA GAS CO., Los Angeles.
Project: 13 miles of 34-in. from San Fernando Valley to West Los Angeles.
Status: Approved.
Completion: 1960.

SOUTHERN CALIFORNIA GAS CO., and **SOUTHERN COUNTIES GAS CO. OF CALIFORNIA**, Los Angeles.
Project: 150-mile line across southern California from the Nevada border to the Los Angeles basin. Line would connect with a proposed El Paso Natural Gas Co. line extending to Rock Springs, Wyo.
Status: Pending approval of State Public Utilities Commission of California.

ST. LAWRENCE GAS CO., Ogdensburg, N. Y.
Project: 75 miles of line from Cornwall, Ont., to Ogdensburg, N. Y.
Status: Approved by FPC.

TENNESSEE GAS PIPELINE CO., a division of Tennessee Gas Transmission Co., Box 2511, Houston 1, Tex.
Project: 21 miles of 16-in. gathering line from Louisiana coast to Block 46 in the Vermilion area.
Status: Pending FPC approval.
Project: 2 miles of 12-in. gathering line from Block 66 to Block 64, East Cameron area, offshore Louisiana.
Status: Pending FPC approval.
Project: 158 miles of 36-in. loop lines at various points between Kinder, La., and Centerville, Tenn.
Status: Approved by FPC.
Project: 11½ miles of 16-in., 44 miles of 12-in., and 10 miles of 10-in. off Louisiana coast.
Status: Pending FPC approval.
Project: 12 miles of 12-in. gathering line from Louisiana coast to Block 17, East Cameron area, offshore Louisiana.
Status: Approved by FPC.
Project: 166 miles of 36 and 30-in. loop lines at various points in Ohio and Pennsylvania.
Status: Pending FPC approval.
Project: 25 miles of 30-in. loop from Hamburg, N. Y., eastward.
Status: Under way.
Contractor: J. P. Neill & Co., Inc., Dallas.
Completion: Fall 1960.

TENNESSEE GAS TRANSMISSION CO., Box 2511, Houston.
Project: For proposal to carry Texas gas to California via Mexico, see Foreign Natural Gas listing.

TEXAS EASTERN TRANSMISSION CORP., Shreveport, La.
★ Project: A new line to take gas from North Louisiana to Kosciusko, Miss., to tie in with the company's main 30-in. line, plus main-line looping.
Status: Proposed.
Project: 85 miles of 24-in. from Tamarack, to Perulack, Pa.
Status: Approved by FPC.
Project: 40 miles of 36-in. from Lambertville, to Linden, N. J.
Status: Approved by FPC.
Project: 23 miles of 20-in. from Eagle, to Chester Junction, Pa.
Status: Approved by FPC.
Project: 53 miles of 30-in. from Perulack, Pa., to Lambertville, N. J.
Contractors: Contracts for the above Texas Eastern projects are held by H. C. Price Co., Bartlesville, Okla.; Western

PIPELINE CONSTRUCTION

Pipe Line, Inc., Austin, Tex.; and Sharman, Allen, Gay & Taylor, Inc., Houston. Completion in 1960.

TEXAS GAS TRANSMISSION CORP., Box 577, Owensboro, Ky.
Project: 29 miles of 12-in. from Slaughters to proposed storage at Greenville, Ky.
Status: Approved by FPC.
Project: 24 miles of 30-in. south of Bastrop, La., and 56 miles of 12-in. loop in Indiana.
Contractor: Western Pipe Line, Inc., Austin, Tex., has contract for the 12-in. in Indiana.
Completion: Fall 1960.
Project: 17 miles of 10-in. from its existing 20-in. line near Thibodaux, La., to a proposed meter station in Bayou Chevreuil field.
Status: Approved by FPC.

TRANSCONTINENTAL GAS PIPE LINE CORP., 3100 Travis St., Houston, Tex.
Projects: 62 miles of 30-in. in Texas and 7 miles of 30-in. in Louisiana.
Status: Pending FPC approval.
Completion: 1961.
Projects: 23 miles of 36-in. in Louisiana, 39 miles in Mississippi, 88 in Alabama, 83 in Georgia, and 36 miles in South Carolina.
Status: Pending FPC approval.
Completion: 1961.
Project: 7 miles of 16-in. in New Jersey.
Status: Pending FPC approval.
Completion: 1961.
Project: 73 miles of 8 to 16-in. offshore Louisiana line.
Status: Under way.
Contractor: Brown & Root, Inc., Houston.
Completion: 1960.
Projects: 1-mile, 16-in. Delaware River crossing in New Jersey and 14 miles of 20-in. in New Jersey and Pennsylvania.
Status: Under way.
Contractor: Fulghum Contracting Corp., Harrisburg, Pa.
Completion: 1960.

TRANSWESTERN PIPELINE CO., 618 First City National Bank Building, Houston 2, Tex.
Project: 250 miles of gathering lines in West Texas and the Anadarko basin.
Status: Temporarily approved by FPC.

TRUNKLINE GAS CO., Box 1642, Houston.
Projects: About 155 miles of 30-in. loop in Illinois, Kentucky, Tennessee, Mississippi, and Louisiana, plus 17 miles of 24-in. loop from Lowry, La., to south of Iowa, La.
Status: Pending FPC approval.
Project: 41 miles of 26 and 16 miles of 20-in. gathering system from Gordy to Cow Island, La.
Status: Pending FPC approval.

UNITED GAS PIPE LINE CO., Box 1407, Shreveport 92, La.
Project: 59 miles of 36-in. purchase lateral connecting Bastian Bay field, Louisiana.
Status: Pending FPC approval.
Completion: Fall 1961.

WESTERN SLOPE GAS CO., 900 Fifteenth St., Denver, Colo.
Project: 6 miles of 6-in. from Palisade to Cameo, Colo,
Status: Proposed.
Completion: November 31, 1960.

Canadian Crude Oil Pipelines

ACT OILS, LTD.
Project: A 450-mile line from the Peace River region to tidewater at Kitimat, B. C.
Status: Proposed.

BITUMINOUS OIL PIPELINE CO. (Royalite Oil Co., and Can-Amera Oilsands Development, Ltd.)
Project: A 250-mile line from Athabasca oil sands to Edmonton.
Status: Proposed.

FEDERATED PIPE LINES, LTD., 304 Sixth Ave., SW., Calgary, Alta.
Project: 36-mile 16-in. loop on the Swan Hills-Edmonton line.
Status: Under way.
Contractor: Majestic Contractors, Ltd., Edmonton.

MATADOR PIPE LINE CORP., Denver.
Project: 175-mile line from Burke, Bottineau, and Renville counties, North Dakota, to Cromer, Man.
Status: Proposed. (See U. S.)

MID-CONTINENT PIPE LINES, LTD., Edmonton, Alta.
Project: 1,500 miles of 30-in. from Edmonton to Chicago. U. S. section to be owned by International Oil Pipeline Corp., New York City.
Status: Pending Canadian Board of Transport Commission approval. W. C. Gilman & Co., New York City, has made preliminary study.

NORTHERN PIPE LINE CO., 30 Broad St., New York 4, N. Y.
Project: 153-mile 16-in. line from Regina, Sask., to Clearbrook, Minn.
Status: Pending National Energy Board approval.
Project: 8 miles of 6-in., 45 miles of 8-in., and 17 miles of 12-in. from its Fox Creek Pump Station to Windfall, Virginia Hills, and Swan Hills fields in Alberta.
Status: Under way.
Completion: Fall 1960.

PEMBINA PIPE LINE, LTD., Drayton Valley, Alta.
Project: 70 miles of 3 to 10-in. gathering lines in Pembina field.
Contractor: Mannix Co., Ltd., Calgary.
Completion: December 15, 1960.

RANGELAND PIPE LINE CO., Calgary.
Project: 111-mile line from Cessford field to Calgary.
Status: Pending approval of Alberta government.

TRANS-PRAIRIE PIPELINES, LTD., 12912 125 Ave., Edmonton, Alta.
Project: Expansion of gathering system in British Columbia will include 40 miles of 4-in. from Taylor to Dawson Creek; 30 miles of 6-in. from Boundary Lake to Taylor; 75 miles of 8-in. from Taylor to Milligan Creek, 11 miles of 4-in. from Milligan Creek to West Beaten; and 4 miles of 8-in. near the Taylor station.
Status: Construction under way on first three projects, but much work will be delayed until January when heavy frost will permit equipment movement.
Contractor: Banister Construction Co., Ltd., Edmonton.
Completion: By fall 1961.

Canadian Products Pipelines

BRITAMOIL PIPE LINE CO., LTD., Box 130, Calgary, Alta.
Project: 126-mile 6-in. line from Pincher Creek to Calgary.
Status: Pending approval of the Alberta Oil and Gas Conservation Board.
Project: 64-mile 8-in. line from Dick Lake to Edmonton, Alta.
Status: Pending approval of the Alberta Oil and Gas Conservation Board.

FOOTHILLS PRODUCTS PIPE LINE LTD., (Pembina Pipe Line Co., Mannix Co., Ltd.), Calgary, Alta.
Project: 1,300 miles of 16-in. from Alberta to Chicago.
Status: Proposed.

HUGHENDEN PIPELINE.
Project: 125 miles from Dick Lake gasoline plant to underground storage in the Hughenden region of eastern Alberta.
Status: Pending approval of Alberta Oil and Gas Conservation Board.

PROVINCIAL PRODUCTS PIPELINES, LTD.
Project: 700 miles of 4 to 12-in. line to pick up propane, butane, and condensates from natural-gas plants in Alberta for delivery to refineries and other plants.
Status: Pending approval of Alberta Oil and Gas Conservation Board.

WESTALTA PRODUCTS PIPELINE, LTD., (Pembina Pipe Line, Ltd., Edmonton, Alta.).
Project: 885-mile 4 to 16-in. gathering system to take natural-gas liquids from plants in Alberta for delivery to proposed trunkline to Great Lakes area.
Status: Pending approval of Alberta Board of Public Utility Commissioners.

Canadian Natural Gas Pipelines

ALBERTA GAS TRUNK LINE CO., LTD., Calgary.
Project: 226 miles of 36-in. and 125 miles of 30-in., plus laterals in southern Alberta including 58 miles of 22-in. and 64 miles of 16-in. (This is part of a 1,400-mile system to move Alberta gas to San Francisco.)
Contractors: Majestic Contractors, Ltd., Edmonton, has 113 miles of 36-in. from Crowsnest Pass to Priddis, 63 miles of 30-in. from Rocky Mountain House to Cynthia, and 38 miles of 22-in. lateral to the Rimbey region. Mannix Co., Ltd., Calgary, has 113 miles of 36-in. from Priddis to Rocky Mountain House. Dutton-Williams Brothers, Ltd., Calgary, has 62 miles of 30-in. from Cynthia to near Whitecourt, Alta., as well as a 20-mile, 22-in. lateral to the Whitecourt area. Piggott Construction, Ltd., Edmonton, has 64 miles of 16-in. lateral from Crowsnest Pass to Carway, Alta., on the U. S. border.
Completion: To be in use during the 1961-62 winter season.
Projects: The following laterals will be built in 1961 to tie in with the above mentioned 1,400-mile project from Alberta to San Francisco: 15 miles of 12-in. to Buck Lake, 23 miles of 22-in. to East Calgary, 15 miles of 16-in. to Carstairs, 4 miles of 8-in. to Sarcee, and 10 miles of 10-in. to Wildcat Hills. Other laterals to be built in the future will connect Kaybob, Berlend River, Lovett River, and Stolberg.

ALBERTA NATURAL GAS CO., LTD. (Pacific Gas & Electric Co., San Francisco, and Westcoast Transmission, Calgary.)
Project: 108 miles of 36-in. from Crowsnest Pass across southeastern British Columbia to the U. S. border near Eastport, Idaho. (This is part of a 1,400-mile project to move gas from Alberta to San Francisco.)
Contractor: Price-Poole of Canada, Ltd. (Canadian Bechtel, Inc., Toronto, is engineering manager.)
Completion: The system will be in use during the 1961-62 winter season.

CANADIAN INDUSTRIAL GAS, LTD. (formerly Ajax Petroleums, Ltd.), Derrick Building, Calgary, Alta.
Project: 28 miles of 10-in. and 4 miles of 8-in. from Morinville to Westlock Viking Sand field.
Status: Planned.

PIPELINE CONSTRUCTION

Completion: By September 1961.

CARTIER GAS CORP. (St. Maurice Gas, Inc. and Consumers' Gas Co., Toronto).
Project: 170 miles from Montreal to Quebec City.
Status: Proposed.

GAS TRUNK LINE OF BRITISH COLUMBIA, LTD., Pacific Bldg., Calgary.
Project: 245-mile, 30-in. extension of Westcoast Transmission system from Taylor, B. C., to Fort Nelson.
Status: Under way.
Completion: December 1961.

MAGNA PIPELINE CO., LTD., Nanaimo, Vancouver Island, B. C.
Project: 25 miles of 4.85-in. double flexible plastic pipe from Huntington, B. C., to Vancouver Island.
Status: Approved by British Columbia Public Utilities Commission. Tentative timetable calls for work to start by spring 1961.

NORTHERN ALBERTA PIPE LINES, LTD., Edmonton, Alta.
Project: 110-mile trunk line, plus gathering system, from Lac La Biche, in McMurray vicinity, to Edmonton.
Status: Pending provincial approval.

QUEBEC GAS TRANSMISSION LINES, INC., 1610 Sherbrooke St. W., Montreal.
Project: 300-mile line from Montreal to Quebec City.
Status: Proposed.

TRANS-CANADA PIPE LINES, LTD., Toronto.
Project: 390 miles of 34-in. main-line loop between Burstall and Winnipeg, Man.
Status: Planned. About 268 miles scheduled for construction in 1961, and 122 miles in 1962.

UNION GAS CO. OF CANADA, LTD., 48 Fifth St., Chatham, Ont.
Project: 12 miles of 8-in. on the Woodstock-Norwich line in Ontario.
Contractor: Majestic Contractors, Ltd., Toronto.

VAN TOR OIL & EXPLORATION CO., Vancouver, B. C.
Project: Line from British Columbia mainland to Vancouver Island.

WESTCOAST TRANSMISSION CO. LTD., Calgary.
Project: 688-mile, 30-in. loop of British Columbia-Washington line.
Status: Proposed.
Project: (See Alberta Natural Gas Co., Ltd., for joint project).

Foreign Crude Oil Pipelines

ABU DHABIE MARINE AREAS, LTD. (partly owned by British Petroleum Co., Britannic House, Finsbury Circus, London E.C. 2).
Project: 20 miles of 18-in. from offshore Persian Gulf pool to Das Island.
Completion: 1962.

ARAB PIPELINE.
Project: 1,250-mile pipeline from the Persian Gulf to Mediterranean.
Status: Proposed by Saudi Arabian Government and approved by the Arab League's petroleum department.

BARNABO GROUP (Italian interests).
Project: A line from Venice, Italy, to Innsbruck, Austria, which could then be extended to Munich, Germany.

BASRAH PETROLEUM CO.
Project: 20 miles of 16-in. from Zubair field to Shamiya.
Contractor: Mothercat Co., Ltd., Beirut, Lebanon.
Completion: November 1961.
Project: 65 miles of 30 and 32-in. from Zubair to Fao in southern Iraq.
Contractor: Turriff-Burden, Ltd., Tulsa.
Completion: 1961.

CREOLE PETROLEUM CORP., Caracas.
Project: About 14 miles of 8 to 24-in. gathering line in Lake Maracaibo.

EASTERN BLOCK COUNCIL FOR MUTUAL ECONOMIC AID.
Project: 2,500-mile "Vomecon" pipeline from the Volga-Ural oil fields in Russia to East Europe satillites.
Status: Construction under way in Poland, Hungary, and Czechoslovakia, with completion of latter section by early 1961. Partial operation of the over-all system expected in 1963.

ENI (Italian state oil agency) and **ITALO-SWISS FINANCE CO.**
Project: A 700-mile system from Genoa to Aigle, Switzerland, thence northeast to the German border, where it would split with one branch going to Munich and another branch to the Karlsruhe area. Feeder lines would go to Turin, Milan, and Cremona, Italy.
Status: The trunk line from Genoa to Aigle approved by the Italian Government.

ESSO STANDARD (LIBYA), INC.
Project: 100 miles of 30-in. from Zelten field to Gulf of Sirte.
Status: To start construction near the end of 1960.
Contractor: Bechtel Corp., San Francisco.
Completion: Mid-1961.

GERMAN LINE planned by eight German refining and marketing companies (British Petroleum, Esso, Deutsche Erdoel, Shell, Gelsenberg-Benzin, Mobil, Schloven-Chemie, and Wintershall).
Project: 155-mile, 24-in. line to Bavaria from Karlsruhe which is the northern

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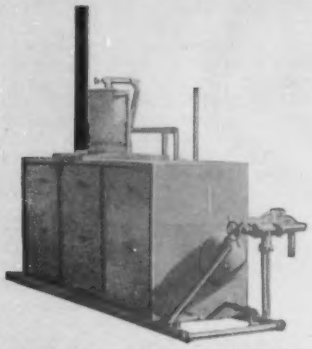

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PIPELINE CONSTRUCTION

terminus of the big South European Pipeline Co. project from Marseille to Germany.
Status: Planned.

IRANIAN OIL EXPLORATION & PRODUCING CO.
Project: 30 miles of 20-in. and 22 miles of 16-in. looping of Agha Jari to Bander Mashur line.
Status: Planned.

IRAQ PETROLEUM CO., LTD., 214 Oxford Street, London, W. 1.
Project: 28 miles of additional 30-in. loop in Syria.
Status: Under way.

OASIS OIL CO. OF LIBYA, 539 South Main St., Findlay, Ohio. (Other participants are Esso Sirte and Libyan American Oil Co.).
Project: 86 miles of 30-in. from the Dahra area of Libya to El Sider on the Mediterranean Coast, and 36 miles of 20-in. feeder line from the Mabruk area to the 30-in. line.
Status: Pending approval of the Libyan Petroleum Commission and the provincial government of Tripolitania.

OIL INDIA, LTD. (Burmah Oil Co. and Assam Oil Co., two-thirds, and India Government, one-third).
Project: 720 miles of line in northeast India. This will include 250 miles of 16-in. from Nahorkatiya to Noonmati and 470 miles of 14-in. from Noonmati to Barauni.
Contractors: Mannesmann, a German firm, will lay the 260-mile 16-in. system. Contract for the 460-mile 14-in. line has been awarded to an Italian Government company.
Status: To start November 1960.
Completion: The 16-in. system is scheduled for completion in March 1962.

PETROLEO BRASILEIRO S.A. (Brazil).
Project: 250-mile line from Rio de Janeiro to Belo Horizonte refinery site.
Status: Under consideration.,
Project: 35 miles of 8 to 12-in. pipe from Buracica to Candeia.
Contractor: Techint, Inc., Milan, Italy.
Project: 80 miles of 24-in. to tie in to proposed Caxias refinery near Rio de Janeiro.
Status: Planned.

ROYAL DUTCH-SHELL.
Project: 12-mile line from Gore Bay, Australia, to Royal Dutch-Shell's Clyde refinery.
Status: Planned.
Project: 161 miles 20-in. line from Tandzung field to Balikpapan refinery, Borneo.
Status: Planned.
Contractor: Williams Brothers Overseas, Ltd., Tulsa, and John Brown, Ltd., London.
Completion: January 1, 1962.

SHELL-BP PETROLEUM DEVELOPMENT CO. OF NIGERIA, LTD., 38/39 Marina, Lagos, Nigeria.
Project: 18 miles of 12-in. line from Port Harcourt to Bonny, Nigeria.
Status: Under way.
Constructor: African Construction Co.

SOUTH EUROPEAN PIPELINE CO. (Jersey Standard, Caltex, Shell, British Petroleum, and 12 other firms.)
Project: 419 mile 30-in. line from Lavera, near Marseille, to Strasbourg, with 40-mile extension to Karlsruhe, Germany.
Status: Construction to get under way by January 1961.
Completion: 1962.

SYRIAN PIPELINE, Damascus.
Project: 500-mile line from Karshuk field, Syria, to Mediterranean.
Status: Proposed.

UNION OF SOVIET SOCIALIST REPUBLICS.
Project: 2,315 miles of 28-in. Trans-Siberian crude-products line from Ufa and Tuimazy fields in Bashkiria to Irkutsk.
Status: Under way.
(See Eastern Block for information on new East Europe line).

YACIMIENTOS PETROLIFEROS FISCALES (Argentina), Buenos Aires.

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DALLAS MFG. COMPANY
3505 GREENBRIER DRIVE
DALLAS, TEXAS

PIPELINE CONSTRUCTION

Project: 390 miles of 14-in. from fields in Neuquen Province, Argentina, to Bahia Blanca.
Status: Under way.
Project: 625 miles of 12-in. from Mendoza to San Lorenzo.
Status: Planned.

Foreign Products Pipelines

ARABIAN AMERICAN OIL CO., Dhahran, Saudi Arabia, and 505 Park Avenue, New York.
Project: 37 miles of 8-in. LPG line from Abqaik to 'Ain Dar.
Contractor: Company personnel.
Completion: 1961.
Project: 6½ miles of 6-in. LPG line from Ras Tanura refinery to the terminal.
Status: Under way.
Completion: Fourth quarter 1960.

ESTRADA FERROVIARIA SANTOS A JUNDIAL, Sao Paulo, Brazil.
Project: 25 miles of 6-in. ethylene line from Cubatao to Rio Grande.
Contractor: Techint, Inc., Milan, Italy.

NATIONAL IRANIAN OIL CO., Teheran.
Project: 510 miles of 8-in. from Teheran to Meshed, Iran.
Status: Under way.
Contractor: Williams Brothers, Tulsa, has contract for about half this project.

NORTH ATLANTIC TREATY ORGANIZATION (Bid details from Bureau of Foreign Commerce, U. S. Department of Commerce, Washington).
Project: 57 miles of 8-in. in Germany to Land Baden-Wuerttemberg air field.
Project: 93 miles of 6-in. in Turkey.

PETROLEOS MEXICANOS.
Project: 291 miles of 8-in. from Torreon to Chihuahua.
Completion: March 1961.

PIPELINES OF PUERTO RICO, San Juan.
Project: 95 miles 8-in. from Penuelas to Catano.
Status: Approved by Puerto Rican Public Service Commission.

SYRIAN PIPELINE.
Project: About 310 miles from Homs to tank farms in the Damascus, Aleppo, and Latakia areas.

UNION OF SOVIET SOCIALIST REPUBLICS.
Project: 2,315 miles of 29-in. Trans-Siberian crude-products line from Ufa and Tuimazy fields in Bashkiria to Irkutsk.
Status: Under way.
Project: 700 miles from Novo-Kuibyshev refinery to Bryansk.
Status: Under way.

YACIMIENTOS PETROLIFEROS FISCALES (Argentina), Buenos Aires.
Project: 652 miles of 10-in. from Lujan de Cuyo to Buenos Aires.
Status: Planned.

Foreign Natural Gas Pipelines

BASRAH PETROLEUM CO., LTD., 214 Oxford St., Oxford Circus, London W. 1, England.
Projects: 65 miles of 12 to 16-in. line from Zubair to Fao, Iraq, and 19 miles of 12-in. from Zubair to Rumailah.
Contractor: Mothercat Co., Ltd., Beirut, Lebanon.
Completion: April 1961 for line to Fao and October 1961 for Rumailah line.

GASES NATURALES DE COLOMBIA, S.A. (Owned 50% by Colombian Petroleum Co., which is affiliated with

102*

102 — that's the number of Nelson high voltage starters in use at just one of the many refineries using Nelson electrical control equipment.

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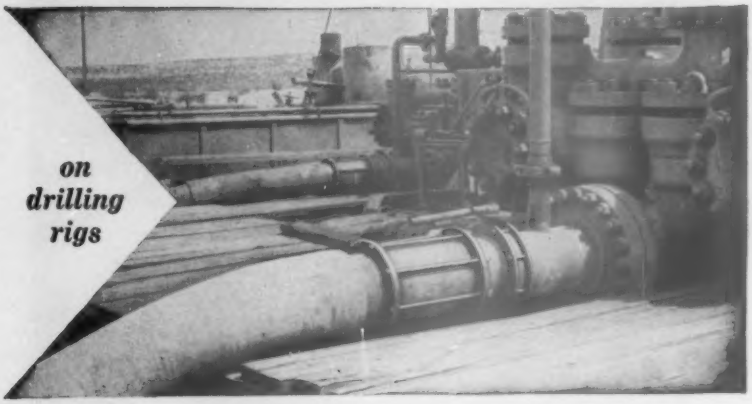

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PIPELINE CONSTRUCTION

Mobil International and Texaco, and 50% by local interest.)
Project: 140 miles of 10-in. from Cicuco field to the Caribbean port of Barranquilla.
Completion: Late 1961.

INDIA.
Project: India plans to start formal talks with Pakistan soon concerning possibility of importing natural gas from Sui field into India.
Status: Preliminary studies indicate a pipeline to Bombay might be commercially sound.

ISRAEL GOVERNMENT and private interests.
Project: 17-mile, 6-in. line from Zohar field to the Dead Sea.
Status: Bids sought.
Completion: February 1961.

MENE GRANDE OIL CO., Caracas.
Project: 19 miles of 12-in. from East Soto to Zapatos.
Completion: 1960.

PAKISTAN INDUSTRIAL DEVELOPMENT CORP.
Project: 1,000-mile system to carry gas from Sui field northward from Multan to Lyallpur, Lahore, Daudkhel, Islamabad, Rawalpindi, and Wah. This would require a loop to an existing 310-mile 16-in. line from the Pakistan petroleum field to Multan.
Status: Under consideration. Technical survey has been ordered.

PAKISTAN PETROLEUM CO.
Project: 145 miles of 8-in. from Sylhet field to Daccq, East Pakistan.
Status: Proposed.

PETROLEOS MEXICANOS.
Project: 483 miles of 24-in. from Jose Colomo field in State of Tabasco to Mexico City.
Status: Under way.
Contractors: Condusa is contractor. Contracts for eight river crossings awarded to Collins Construction Co., Port Lavaca, Tex., and Constructora Inde S. A. de C. V., Mexico City.
Completion: November 1960.
Project: 200 miles of 14-in. from Mexico City to Salamanca.
Status: Planned.
Completion: September 1961.
Project: 291 miles of 12-in. from Torreon to Chihuahua.
Completion: March 1961.

QATAR GOVERNMENT.
Project: 65 miles of 10-in. from Dukhan to Doha.
Contractor: Mothercat Co., Ltd., Beirut, Lebanon.
Completion: April 1961.

SOC. SICILIANA METANADOTTI (SOSIM). Partners include Edison Power, Italcementi, Fiat Motor, Sicilian SGES Power, Bombrini Parodi Delfino Chemical, and Montecatini.
Project: 560 miles from Hassi R'Mel gas field, Algeria, to Cape Bon, Tunisia, 77 miles across the Sicilian Channel, into northern Italy and beyond.
Status: Engineering studies under way.

SOTHRA.
Project: A 315-mile system from Hassi R'Mel gas field in Algeria to the Mediterranean Coast, including 262 miles of 24-in. trunk from Hassi R'Mel to Relizane and 20-in. from Relizane to Arzew, plus branches to Oran and Algiers.
Status: Under way.
Contractors: Groupement Entrepose-Ste. Parisienne pour l'Industrie Electrique (GREP) has contract for 200 miles from Hassi R'Mel to Tiaret. Socoman has

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Shipping costs drop, handling speeds up with Elder's "Knock-Down" units. Now you can ship field housing overseas or move complete camps to new locations at one-fifth the cost!

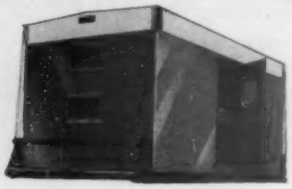
"Knock-Down" units are quickly erected with a minimum of labor. Side walls, mounted on continuous hinges, simply raise into place. End walls are bolted into side walls and frame. Fiberglass roof is one-piece construction.

Elder designs and builds all types of mobile housing for field crews.

Knock-down unit ready for setting up.

Side walls go up first.

End walls and roof are locked securely into place.



Unit erected.

Eight knocked-down units loaded and ready for shipment.

ELDER TRAILER AND BODY, INC.
DENVER PLANT: 4830 Race Street. Phone AMherst 6-1781
HOUSTON PLANT: 4510 Navigation Blvd. Phone WAlnut 6-8335

PIPELINE CONSTRUCTION

contract for 115 miles from Tiaret to Arzew.
Completion: Spring 1961.

STANDARD-VACUUM OIL CO., New York.
Project: 60 miles of 8-in. from Radja field to Palembang, Sumatra.
Status: Planned.

TEIKOKU OIL CO. and **TOKYO GAS CO.**
★ Project: These two companies are negotiating a proposed 200-mile, 12-in. system to move gas from Kubiki gas field in Japan.
Status: Proposed.

TENNESSEE GAS TRANSMISSION CO., Box 2511, Houston.
Project: 1,100-mile, 34-in. line from Reynosa, near the southern tip of Texas, across Mexico to San Luis Rio Colorado, near the California border.
Status: Agreement signed by Petroleos Mexicanos and Tennessee Gas Transmission.

UNION OF SOVIET SOCIALIST REPUBLICS.
Project: 250-mile line from Ust-Vilyuisk field to the Siberian cities of Yakutsk and Pokrovsk, plus feeder lines to supply villages in the Lena River Valley.
Status: Planned.
Completion: Date not set yet.
Project: Two parallel, 40-in. lines, each over 1,300 miles long, from Gazli near Bukhara, northward to Sverdlovsk and Chelyabinsk.
Status: Planned.
Project: Line from Samarkand through Tashkent to Chimkent, Dzhambul, Frunze and Alma-Ata near Chinese border.
Completion: Line from Samarkand to Tashkent expected to be finished in 1960. Completion of rest of line expected by 1965.
Project: Line from Berezovo field southward to Sverdlovsk.
Status: Proposed.
Project: 438 miles from Dashava in Carpathian Mountains to Minsk.
Status: Under way.
Completion: 1960.
Project: Line from Minsk northward to Baltic Sea area.
Completion: To Vilnius, Lithuania, in 1961; to Riga, Latvia, in 1962.
Project: Line from Minsk northeast to Leningrad.
Status: Proposed.
Project: 405 miles from Saratov north to Gorki via Penza.
Status: Under way.
Completion: 1960.
Project: 800-mile, 32-in. loop of existing line from Stavropol fields in northern Caucasus to Moscow.
Status: Under way.
Completion: 1960.
Project: 800-mile, 40-in. line from Krasnodar fields north of Caucasus Mountains to Serpukhov, south of Moscow, via Rostov and Lugansk.
Status: Under way.
Project: 310-miles of 32-in. line ringing Moscow at radius of about 50 miles.
Status: Under way.
Completion: 1962.

YACIMIENTOS PETROLIFEROS FISCALES (Argentina), Buenos Aires.
Project: 1,000-mile line from Comodoro Rivadavia to Buenos Aires with a spur to Plaza Huincul field in Neuquen province. Line will be 26 in. to the connecting point for the Plaza Huincul link and 30 in. from the connection to Buenos Aires.
Status: Proposed.

213

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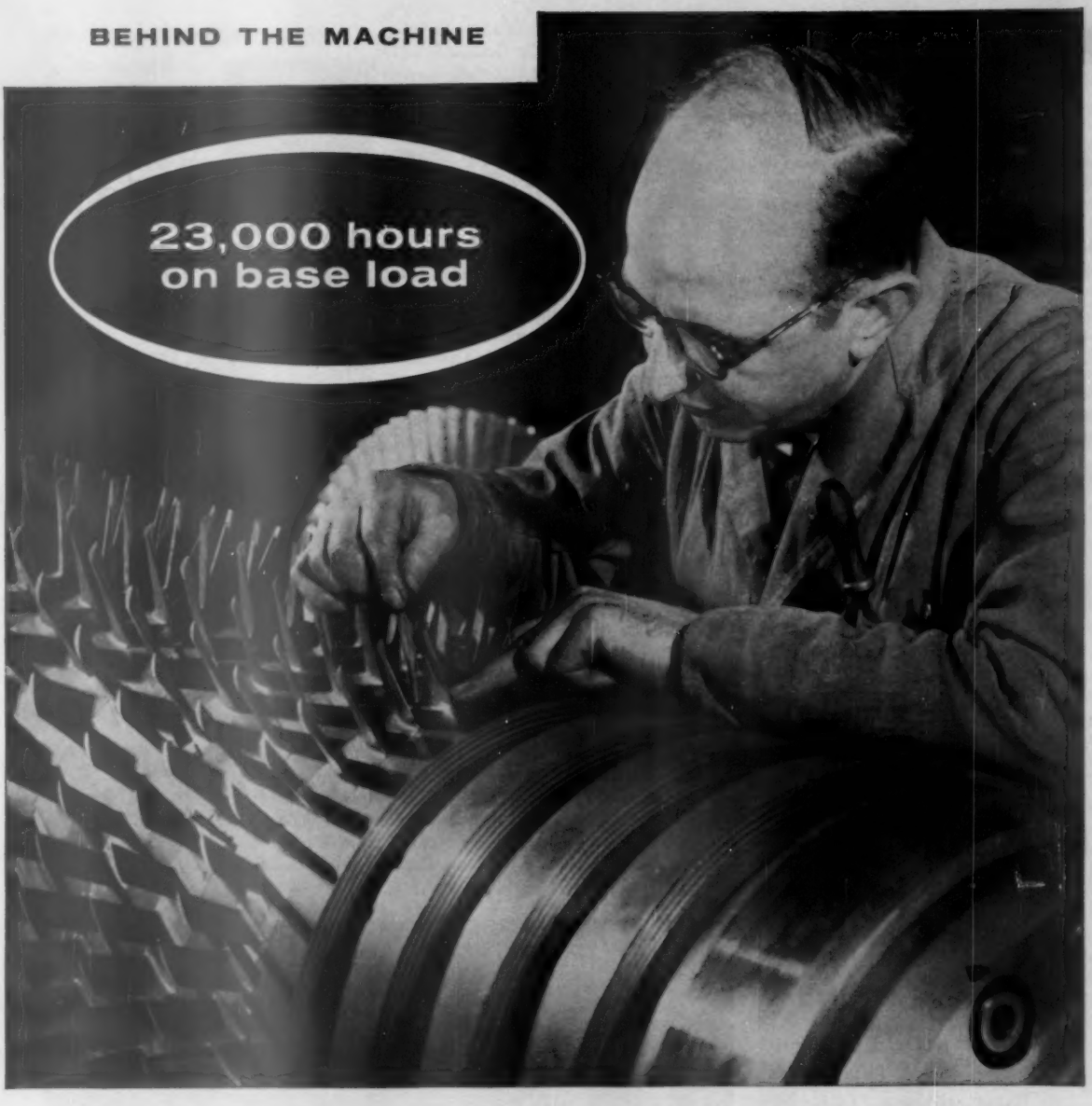

The proved reliability of AEI industrial gas turbines is typified by a machine in Venezuela which has recently completed 23,000 hours running on base load. AEI makes a range of industrial gas turbines with ratings from 1,750 kW upwards designed to run on gaseous or liquid fuels.

The picture shows work on the compressor rotor of L2IC gas turbines being built, at the AEI Turbine-Generator Division Factory for the Basrah Petroleum Co. These feature a single shaft design which ensures stable regulation and makes them particularly suitable for parallel operation with other generating equipment.

This is a product of AEI Turbine-Generator Division, Britain's largest manufacturer of Turbine-Generators.

AEI Associated Electrical Industries Export Ltd
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B/L002

▶▶▶ Equipment Men Notes

F. H. Shepheard leaves Britain

... for a 35,000-mile 9-week sales visit to Latin America. Shepheard is Perkins Engines Ltd.'s zone manager for Latin America and the Iberian Peninsula. During the tour visits are planned with distributors, manufacturing customers, and operators in Mexico, Argentina, Uruguay, Chile, Paraguay, Bolivia, Peru, and Guatemala.

Charles C. Snider elected veep

C. C. Snider

... of Consolidated Electrodynamics Corp., subsidiary of Bell & Howell Co. In the newly created post, Snider will direct CEC's international operations, provide liaison between the company's product divisions and the international requirements of the parent company, and contribute to product and policy planning for Bell & Howell's total international activities. He will report to Everett F. Wagner, vice president of Bell & Howell's International Division.

For the past year, Snider has been director of sales for CEC's four data-processing divisions. He joined the company in 1952 as a field engineer; became manager of the southeastern regional office in Atlanta in 1953; and director of sales for the Transducer, Datalab, DataTape, and Electro Mechanical Instrument Divisions last year.

Parkersburg Rig & Reel moves

... its Export Division from New York to company headquarters in Houston, and names Meredith Roberts and Willi Stahl as export sales manager and assistant export sales manager, respectively, to head the newly expanded division.

Until recently, Roberts served as manager of Parkersburg's South American sales, operating out of Caracas and Maricaibo. Prior to joining the company in 1954 as a field salesman, he was employed by Fairbanks, Morse & Co. where he worked with diesel engines.

Stahl, a native of Switzerland and a graduate mechanical engineer from the State University of Bern, has been a Parkersburg development engineer on glycol dehydrators, steam generators, and salt bath heaters for the past 4 years. He was previously employed by Saurer, Ltd., Brown Boveri, Ltd., and for 7 years, served as development and design engineer on steam boiler and heat-exchanger installations for Sulzer Brothers, Ltd.

U. S. Industries' divisions join

... announces John I. Snyder, Jr., chairman and president of USI. Involved in the consolidation are Axelson Division of Los Angeles and St. Louis, and Garrett Oil Tools Division of Longview, Tex. The single division, to be headquartered in Longview, will be known as Axelson-Garrett Division. Taylor Milton, president of Garrett Division, will become president of Axelson-Garrett.

CBMPE holds annual dinner

... at the Great Room, Grosvenor House in London, England before 1,540 guests. Chairman of the Council of British Manufacturers of Petroleum Equipment was J. M. Storey, C.B.E., managing director of Dewrance & Co., valve manufacturers.

Principle guest speaker was Sir John G. Wrightson, Bt., T.D., chairman of Head Wrightson, Ltd., one of the founding firms of the council. Among other guests were members of the British Government and representatives of numerous other governments.

J. T. Douglas is sales manager

J. T. Douglas

... of the Louisiana Gulf Coast division of Schlumberger Well Surveying Corp. He will headquarter at Lafayette, La. Douglas served as division engineer at Lafayette prior to this promotion.

Joining Schlumberger in 1947 as an engineer trainee at Laurel, Miss., he was subsequently named field engineer and assigned to Opelousas, Lake Charles, and Donaldsonville, La., locations. In 1954 he was advanced to location manager, serving in that capacity at Donaldsonville, New Iberia, and Morgan City before being named division engineer.

Other changes in the Louisiana-Mississippi field staff include the transfer of H. H. Ham, location manager at Laurel, to Houma, La., as senior sales engineer. J. D. Cunningham succeeds Ham as Laurel location manager. He previously was assigned to Donaldsonville.

C. B. Dennis will fill the post of location manager at Donaldsonville, transferring from the southern Louisiana division where he had served as sales engineer.

STUDYING BOTTOM-HOLE PATTERNS cut in a block of pink quartzite in Hughes Tool Co.'s Houston drilling laboratory are, from left, M. E. Montrose, Hughes senior vice president and general manager; Lord Glentoran, minister of commerce of North Ireland; and H. E. Rogers, Hughes vice president of manufacturing. Montrose is also managing director of Hughes Tool Co., Ltd., a wholly owned subsidiary with a rock-bit manufacturing plant in Belfast, Ireland. As minister of commerce, Lord Glentoran played an active part in helping Hughes to locate in Belfast.

Alexander Valchuk becomes

A. Valchuk

. . . managing director of Byron Jackson's manufacturing plant in the Netherlands, announces Andrew W. Rose, president of the division of Borg-Warner Corp. Valchuk will succeed Earl M. Rees, who has directed plant operations since supervising organization and construction of the facility which officially opened in September 1959.

Known as Byron Jackson N.V., this wholly owned company subsidiary is currently manufacturing BJ oil tools for the export market. Byron Jackson N.V. is located in Etten en Leur, North Brabant Province in the south of Holland.

Valchuk, who has been with the company since 1947, most recently served as northeast regional manager in the United States for Byron Jackson Pumps, Inc. He now will report directly to Robert T. Harcus, BJ executive vice president.

Frederick Rich named manager

. . . of Canadian operations for Farris Engineering Corp., Palisades Park, N. J., manufacturer of safety-relief valves, flexible valves, steam traps, plastics take-off machines, and fuel economizers. Rich will be located at the company's new plant in Ville Jacques Cartier, a suburb of Montreal. He will manage all manufacturing, sales and service activity for Farris Industries Canada, Ltd.

Rich served for 15 years as chief instrument engineer at Arabian American Oil and at Arthur G. McKee Co. During the past year he was retained as engineering consultant by the Puerto Rican government for the construction of a 165,000 kw.-steam power plant.

Ray L. Sewell to represent

. . . Hunt Tool Co.'s cutting and fishing-tool service division in Louisiana and Mississippi. He will also direct his activities toward the sale and rental of stabilizers, combination bits, and Hunt-Cullum hardbanding.

Prior to joining the Hunt organization, Sewell served as a driller and tool pusher in Oklahoma, Kansas, and New Mexico. From 1956 to 1959 he served as fishing-tool operator in Louisiana, and from 1959 to the present he operated a rental-tool business in New Iberia, La.

B. R. Dixon is advanced

. . . to vice president — operations for Johnston Testers, Inc., and elected to the firm's board of directors. In this capacity he will coordinate all domestic sales and service operations. Dixon, who formerly served as Johnston's operations manager, has been with the firm the past 6½ years. He served as northern division manager in Denver before being moved to Houston as operations manager. Before joining Johnston, Dixon was with J. S. Abercrombie Co. and Stanolind Oil & Gas Co.

BJ Service shifts A. T. Jones

A. T. Jones

. . . assistant to the sales manager, from Fort Worth to Wichita, announces A. M. Birnie, vice president. Jones, a 5-year company veteran, has held a variety of field and technical positions, ranging from "treater" to district engineer.

Republic Flow Meters Co. joins

. . . its valve sales and engineering into a single department, and makes two appointments within the department.

Albert J. Rosenberger, former chief mechanical engineer, was appointed

A. J. Rosenberger

W. R. Robinson

manager of the valve sales and engineering department. William R. Robinson, former manager of Republic's St. Louis district office, was named valve sales supervisor.

Rosenberger, who joined Rockwell-Republic in 1935, has been a contract engineer and chief design engineer. Robinson joined Rockwell-Republic in 1956. He was a sales engineer in Pittsburgh for 3 years before becoming St. Louis district manager.

Motorola, Inc. awarded contract

. . . for a 350-mile microwave radio communications system for Magnolia Pipe Line Co. The system, scheduled for operation early next year, will provide 18 voice communications circuits between the company's major storage terminal at Corsicana, Tex. and its West Texas gathering terminal at Midland.

The new system, complete with 12 microwave stations, will connect with a 260-mile microwave network linking the Corsicana terminal and the Beaumont refinery of Mobil Oil Co. Magnolia is an affiliate of Mobil.

E. G. Holm, Jr. elected to board

. . . of Tuboscope Co. He is president of Tube-Kote, Inc., a Tuboscope subsidiary, and has been associated with Tube-Kote for the past 14 years.

Geophysical Service realigns

. . . its gravity department which will now be responsible for the operation of all GSI gravity meter exploration crews in the United States, along with providing supervision and interpretation for all gravity operations outside the United States. Prior to now, operation of the crews was under the supervision of the manager of the area in which the crew was operating.

Dr. Richard A. Geyer, who has been with the gravity department since 1954, becomes manager of gravity operations with headquarters in Houston. He will be assisted by supervisors Morris McCord, in Houston, and Norman Harding, in Denver. Dr. Geyer's group will report to N. W. Mann, vice president in charge of U. S. and Canadian operations.

W. S. Bowers joins Foxboro

. . . to specialize in sales promotion and instrument engineering, helping to direct company activities in the oil-refining industry. Bowers joined Standard Oil Co. of Ohio in 1948, organizing an instrument team which he later developed into a control-systems group responsible for systems design and plant-control services.

Previously, Bowers served with American Cyanamid Co. as a chemical engineer and with H. K. Ferguson Co. as an instrument engineer.

LOOSE SANDS?

SANDBAN
SCREEN

Sandban* screen is a new tool for controlling sand production. Sandban screen consists of a slotted aluminum screen, a smaller aluminum or steel screen inside and a permeable network of plastic-coated walnut shells between the screens. Sandban screen is easy to use—and economical. Available sizes: 4-inch O.D. with 1½-inch steel screen inside; 5⅝-inch O.D. with either 2⅞-inch steel screen or 2-inch aluminum screen inside. Other sizes made to order. Ask a Dowell engineer about Sandban screen.

*Dowell Trademark

Products for the oil industry

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DIVISION OF THE DOW CHEMICAL COMPANY

DIAL DOWELL

▶ ▶ ▶ Among the Drilling Contractors

Unusual problems met in North

LETHAL MEMENTO OF WW II is examined by Mud Engineer Ralph LeMaster. Over 3,000,000 land mines, booby traps, and bombs, all unexploded, are believed lying in the desert. Rig in background is Mobil Oil Co. of Canada 1 El Rakb, 220 miles south of Bengasi.

LIBYAN LABORERS are chopping up long strips of cellophane for use as lost-circulation material.

GEOLOGICAL TRAILER of Mobil of Canada is air-conditioned and sand and dust-proofed. Sample sacks of cuttings are seen in tray.

Africa drilling

THREE YEARS AGO a group of specialists went to Libya to engage in a drilling campaign. Here are some highlights of the 2-year contract as reported by one of these men—Ralph LeMaster of Price, Utah, mud engineer.

Rig 2 of Camdrill International, Inc., Los Angeles, was shipped to the Libyan desert in 1957 to work for Mobil Oil Co. of Canada. Accompanying the rig and its auxiliary equipment to the first location were personnel which included 11 Americans, a Greek electrician, 32 Arabs, and 16 Italians. Despite the mixture of languages which created minor difficulties in execution of orders, not a single major industrial accident occurred during the 2-year period.

Most of the equipment was specially designed for desert work. In addition to the American-made rig, a complete community is comprised of portable houses, trailers, and tents, trucks for well servicing and moving, and aircraft. All told, including rig, camp equipment, and drilling supplies, over 140 truck loads were required for each move. Communications equipment was used to contact the base camp in Tripoli, from which the well sites were supplied by air. Often this was 450 air miles away.

During the contract period, six wildcat wells were drilled for a total of 55,149 ft. Depths of these tests varied from 6,291 to 11,290 ft. A total of 40,245 ft. of casing (all sizes) run into the holes.

Mud problems were not great. Typical mud program included low pH, low weight, and CMC and DME diesel-oil emulsion. Low filtration, 2 to 5 cc., medium viscosity of 40 to 55 seconds, and weights under 10 lb. per gal. were used. The pH was 7 to 8, and 8 to 15% diesel oil by volume was used. A total of 43 days used to combat lost circulation.

Operations other than drilling included: 44 days to run logs, 358 trips for bit changes (500 in all), 111 diamond cores, and 47 open-hole tests. Tearing down, rigging up, and moving consumed 204 days.

Living conditions. Rig and camp sites were located in a vast, waterless desert that contained undetected and unexploded bombs and booby traps of WW II. An estimated 3,000,000 land mines were planted by the armies of Rommel and Montgomery during the North African campaign. The severe ghiblis, wind and sand storms, disrupted air traffic and made radio communications impossible. These also affected living conditions despite air conditioning and dustproof facilities in the quarters but no drilling time was lost through them.

Camp housing went through a transition. The first year there were wooden prefabricated houses, tents, and trailers. The 15 bulky houses were replaced by 5 modern trailers. The Libyans and the Italians preferred their tents and had a tent city of 20 huge desert-type tents along with a separate field kitchen and bath house for each group. Though the rig floor was air conditioned, this facility was not used.

The Camdrill people did a fine job in this desert undertaking. The second test was Mobil of Canada's first production in the country. The logistics for the venture was a great effort in itself. Following the screening, selection, assembling, and shipping of personnel and equipment, supplying the group was another challenge. Special design of the modern equipment coupled with experienced men who adapted themselves, made this drilling campaign successful.

CUT MUD COSTS TWO-WAYS WITH "RUMBA" SHALE SHAKERS

"RUMBA" Shale Shakers with De-Sanders will cut your drilling mud costs by removing more shale and sand to give you a cleaner mud, while saving you money on your shaker investment.

"RUMBA" handles more mud, more efficiently because the mud is evenly channeled from the spreader box and directed over the *full width* of the screened surface area. To insure maximum removal of cuttings, "RUMBA" Shakers are equipped with five foot lateral frame struts and distribute an equal amount of vibration to every inch of the under-slung, stainless steel screen cloth. The under-slung vibrating screen cloth also removes tons of sand that would otherwise damage pumps, pistons, liners, and valves. The cloth is attached with stainless steel hooks that will not rust or corrode. Hooks last the life of the screen.

"RUMBA'S" new and improved design of mud tank, by-pass and return mud outlet has been enlarged to handle the flow of the largest pumps in the industry. "RUMBA" Shale Shakers are built stronger. Require less maintenance than any other type of shale shaker.

"RUMBA" Shale Shakers and De-Sanders are sold through supply stores everywhere.

HUTCHISON MANUFACTURING COMPANY
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A SUBSIDIARY OF REVERE ELECTRIC MANUFACTURING CO.

DRILLING BRIEFS

DRILLING MUD DATA — REPORT 60-4

DRISCOSE* Lowers Drilling Costs . . . Letters tell us why!

Since we started these bi-monthly newsletters, we've been getting many reports from the field with drilling case histories and anecdotes of our products in action. Here is the substance of some recent letters that we'd like to pass along.

North Texas Mud Program A Big Success.

A Texas mud engineer has written us about the success of our North Texas mud program. This Driscose low-solids mud program was prepared at the request of an operator in the area and was based on a test well representative of the locality. Comparison with three nearby wells using different programs showed drilling savings of $7485, $5243, and $4864. In all three comparisons, reduced drilling time and lower bit costs using Driscose accounted for most of the savings, although in two instances, mud costs for the test well were also less.

The low-solids system using Driscose has a low mud weight (9 lbs.), low gel strength, and a fairly low viscosity. In addition to providing increased penetration rates, these conditions also keep mud losses to a minimum — especially in the 4200- to 4800-foot region where fluid losses had previously been high.

Because of the success of the Driscose test well, our "mud guide" is now being widely followed throughout North Texas. While the mud engineer on the job must make the "decisions of the moment" (changing viscosity, chemical treatment, etc.) to suit the particular well, the "guide" specifies such factors as: percent of oil (up to 4%) . . . the rate of adding High Viscosity Driscose (100 lbs. per drilling day from surface pipe to TD) . . . basic chemical treatment (caustic, soda ash, thinners) . . . top limit of mud weight (9.6 lbs./gal. below 4200') . . . table of best funnel viscosities for various depths (from 32 at surface pipe to 125 at 7000 feet) . . . recommended viscosity for running logs and casings, etc. This North Texas mud program will be furnished upon request. Let us know if you're interested.

Comments from Louisiana

The following comments are quoted from recent letters received from Southern Louisiana operators.

DISTRICT ENGINEER SAYS: (St. Mary Parish) "Wall cake was reduced from 1/16" to 1/32" after we started decreasing chemical additions and using Driscose to control solids."

SUPERINTENDENT SAYS: (Vermilion Parish) "We figure we saved $2 000 on weight material by using Driscose in a gyp mud to suspend barite."

MUD ENGINEER SAYS: (Cameron Parish) "Driscose not only controlled water loss, but it actually reduced viscosity in a gyp-saltwater mud!"

DRILLING ENGINEER SAYS: (Offshore) "We tried other materials in both lime and low pH muds, and found the cost was twice as much as when we used Driscose."

CORROSION ENGINEER SAYS: (Lafayette Parish) "We had to displace clear fluids in 12 wells with a Driscose packer mud to help prevent pipe corrosion."

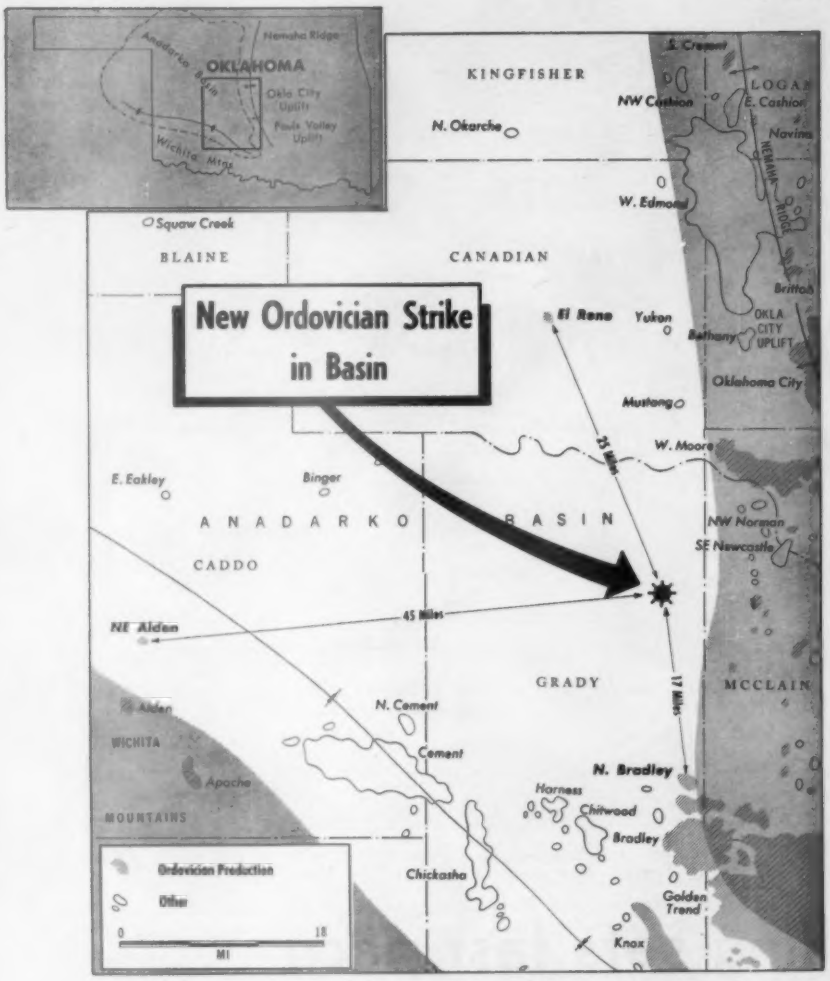
Big Savings Reported on Canadian Wells.

Letters from Alberta tell us of the effectiveness of Driscose low-solids mud systems in the Pincher Creek and Waterton Lakes areas. Here, Driscose low-solids programs have increased penetration rates, improved drilling conditions, and reduced over-all well costs. A cost comparison between a 6000-foot well recently drilled with Driscose low-solids mud (4 to 8% solids) and one of equal depth drilled with a higher-solids mud (10 to 17% solids) showed a $7940 net saving. This saving is even more remarkable in that the well selected for comparison was one of the fastest drilled in the area before the introduction of Driscose low-solids mud.

Performance counts . . . and Canadian operators report that Driscose low-solids muds are now accepted procedure in the area.

*Driscose is a trademark for Sodium Carboxymethylcellulose.

DRILLING SPECIALTIES COMPANY
Bartlesville, Oklahoma



TWO HIGH-YIELD ZONES tested in the first Bromide sand at this Grady County well indicate a significant discovery in the Anadarko basin.

Independents can play the deep country, too

BY PETER BIKE

WHY WILL some of the independent operators persist in seeking production in shallow tired old areas? There are several reasons.

First is that the odds of getting some kind of well are good. Most everyone is convinced that it's easier to find oil in proved areas. Then shallow wells don't cost very much compared to deeper hard-digging tests. Despite usually low lease costs, is the reward worth the effort?

It sounds great when a small firm completes, say, 47 out of 55 shallow wells. What about the reserves? If it is a typically tired old area, the wells may have no better than a 50-50 chance of ever paying out. Or if the breakeven point and little more is reached, it's merely a case of swapping dollars.

Not all independents play just old or shallow areas. Some are checking the deep country with conviction that if they find something, it has possibility of being good and big. Here's what one Oklahoma City group did:

Last week an exploratory strike in Grady County, Oklahoma, in the Anadarko basin made news. The wildcat was Cleary Petroleum, Inc., Calvert Drilling Co., and Eason Oil Co. 1 Hill Top, C NE SW 16-8n-5w. This portion of the basin has low drilling density.

Gas with condensate was encountered in two Ordovician zones in the 1 Hill Top despite the fact that nearest production in the basin from this zone is remote (see map).

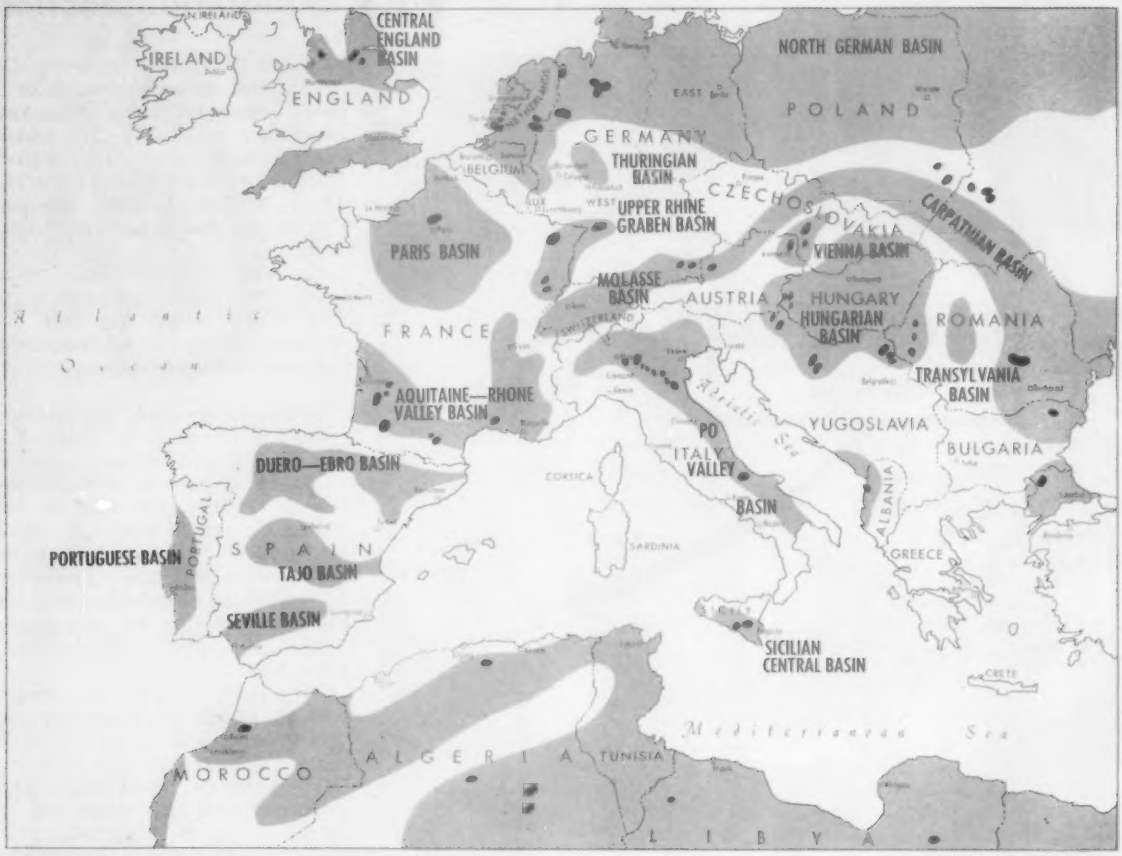
Initial signs are good. The first zone opened in Cleary et al. 1 Hill Top was in the first Bromide zone at 11,708-71 ft. and on drill-stem test flowed 31 M.M.c.f.d. with 10 bbl. condensate per M.M.c.f. A second interval from 11,776-11,814 ft. in the first Bromide sand initially flowed 150 M.c.f.d. After treatment with 1,000 gal. mud acid, flow was increased to 3,680 M.c.f.d. with 92 bbl. condensate per million.

Total depth is 12,975 ft., plugged back to 12,080 ft. Seven-inch production string was set at 12,130 ft.

The approach. These small firms decided to pool their talents and resources and go for a deep one. Prior to drilling, which commenced on May 26, some seismic records previously shot in the area were reviewed for the group by John M. Cochrane, Oklahoma City consulting geophysicist and geologist. Evidence indicated good fault-trap possibilities. These data were tied into existing subsurface correlations obtained from previously abandoned tests.

There weren't very many old tests in the area but a nearby mechanical failure helped solve the puzzle. Offsetting the 1 Hill Top, 40 acres to the southeast, was the Earl T. Mackey 1 Merveldt, C SW SE 16, which was drilled to 10,355 ft. It was abandoned in January after losing 13 drill collars and drill pipe in the hole. Data obtained from the Cities Service Oil Co. 1 Amberg in C NE SW 5-8n-5w, and the George P. Livermore 1 Giles, C NW NW 35-8n-5w, were incorporated into the interpretation. The Amberg drilled in 1951 reached 12,030 ft., and the Giles abandoned in 1946 went to 12,253 ft. Both reached the Bromide and surprisingly, each well had shows in different zones. (There were seven shows altogether in the Giles and eight drill-stem tests were run.)

The results of Cleary and associates only prove—independents can play deep country—successfully.



THIS MAP SHOWS THE VAST OIL POTENTIAL OF EUROPE with its many basins. Europe's geology is varied, grading from salt-dome structures in northern Germany to the highly complex intermontane basins of the Alps.

European drilling sets fast pace

EUROPE is on the threshold of a new oil era. After a slow start following World War II, the continent is in the midst of a busy exploratory and development campaign. Based on the discoveries throughout the continent during the past 2 years, Europeans look to the 1960's as a decade for oil-finding—an economic must as demand grows with giant strides.

Europe's geologic scene. Europe has three general distinctive geological areas.

1. Scandinavia, devoid of young rocks and basins.

2. North Europe, with broad sedimentary basins and large areas of older rocks.

3. The Mediterranean region and southeastern Europe, high mountain chains of youthful topography, lined by narrow sedimentary troughs and interspersed by intermontane basins. Here rocks are of relatively young age.

Many basins. The continental basins of Europe are divided into 8 prominent and from 8-13 minor areas. The continent's many basins are more complicated and more closely crowded than in most parts of the world. These basins are shown on the accompanying map. There are 16 in all excluding

European completions

	Field wells completed in . . .						Wildcats					
	Oil	Gas	Dry	Total	% Success	Active Rigs	Oil	Gas	Dry	Total	% Success	Footage Drilled
Austria	49	13	3	65	95.4	21	1	4	12	17	29.4	447,064
France	53	12	*17	82	80.0	50	6	0	126	132	4.5	1,293,872
Germany	318	(†)	91	409	78.0	128	14	7	78	99	21.0	2,469,400
Italy	20	61	59	140	58.0	36	1	9	70	80	12.5	1,200,516
Netherlands	17	1	7	25	72.0	4	0	2	9	11	18.1	219,117
United Kingdom	14	1	*11	26	75.0	7	2	0	7	9	22.0	136,153
Yugoslavia	...	..	...	...	...	24	4	..	...	4	...	555,000
Total	**471**	**88**	**188**	**747**	**75.5**	**270**	**28**	**22**	**302**	**352**	**12.3**	**6,321,122**

*Ind. injection wells. †Oil & gas. Figures do not include Denmark, Malta, Portugal, Spain, Turkey.

TWO OF AUSTRIA'S BASINS PRODUCE OIL, the Inner Alpine Vienna basin and the Molasse basin. More than 80 wells were completed in these two areas combined last year. There are about 2 dozen rigs running in Austria now.

Central England—a westward extension of the North German basin.

The Big **8.** The most important oil-producing basins of Europe west of Russia are:

1. The Carpathian, covering parts of Czechoslovakia, Austria, Germany, and Switzerland (Molasse basin), and into the Carpathian Mountains of Rumania and Poland. Sediments range from 26,000-40,000 ft. in thickness. Ploesti and Polish fields lie in the deep portion of the basin with its many folds and faults.

2. The North German basin. This one extends from Poland westward through Germany and the Lowlands, across the English Channel into Scotland and England. This basin has many salt domes. Rocks reach 17,000 ft. in depth. The basin is divided into important subdivisions such as the Hanover embayment with most of Germany's big oil fields as well as Holland. Another embayment is in Schleswig-Holstein—characterized by elongated salt ridges of Lower Permian age instead of Upper Permian as in the other domes of the basin. This entire North German basin remains as one of the least-tested and most promising of the world's future oil areas. Its size, depth, and the presence of such favorable structures, point it up as one of the oil arenas not to be bypassed.

3. Hungarian basin. This area lies within the Alps-Carpathian arc. Thickness of sediments reach 16,500 ft. There are six fields, three in Hungary and three in Yugoslavia. Production is from Lower Pliocene and some from Miocene.

4. Vienna basin. This intermontane graben is in the saddle at the junction of the Alps and the Carpathians. Thickness of sediments reaches 17,000 ft. with graben faulting showing up prominently in the subsurface along the sides of the basin. Austria and Czechoslovakia's oil fields are associated with this faulting as well as with buried ridges reflected upward from the basement. Oil comes from Pliocene and Miocene rocks. There are several good oil fields in the basin—there should be many more.

5. Molasse basin. This basin follows the outer rim of the Alps from Czechoslovakia to Switzerland. Sedimentation extended from Middle Oligocene time to Upper Miocene, representing the last of the northward-moving troughs of the Alpine geosyncline. Basin fill is up to 30,000 ft. There has been little oil success in this basin—one field opened last year at 1 Ried.

6. Po basin. This basin follows the outer Appennines along the Po River

Producing wells completed in Europe 1952-1959

		Austria	France	Germany	Italy	Holland	U. K.	Total
1952	TW*	...	16	267	163	43	...	489
	WC†	...	...	44	...	1	...	45
1953	TW	...	8	328	...	49	...	385
	WC	...	2	15	...	3	1	21
1954	TW	...	8	334	47	39	6	434
	WC	...	3	14	13	2	...	32
1955	TW	...	28	369	212	14	6	629
	WC	...	3	15	11	4	2	35
1956	TW	127	24	327	63	7	9	557
	WC	5	1	17	13	5	1	42
1957	TW	110	25	382	93	54	29	‡693
	WC	5	1	18	7	7	2	40
1958	TW	74	28	331	74	30	2	539
	WC	4	5	19	10	5	4	‡47
1959	TW	62	65	318	81	18	15	559
	WC	5	6	21	10	2	2	46
	Total wells	392	223	2,819	797	283	79	...
	Total wildcats	19	21	163	64	29	12	...

*TW = Total wells; †WC = Wildcats; ‡Record year.

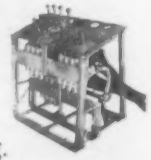
BROWN HYDRAULIC SNUBBER

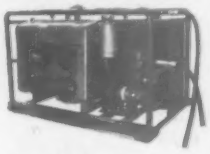
FIRST IN THE FIELD BUT ALREADY PROVEN

Running and pulling pipe under pressure is now a safer, faster, less tedious and cumbersome operation – thanks to the Brown Hydraulic Snubber. Rig and draw works are not needed – wells need not be killed – potential damage to pay zones is eliminated since weighted fluids are not needed – saves time and money with increased safety.

Everything is hydraulic – lifting and lowering, slip actuation and control. Two sets of opposed, double acting slips – one traveling, the other stationary – are hydraulically operated to securely grip the pipe for snubbing in or out. Controls are interlocked so that one set of slips is always engaged.

A remote hydraulic power source, control panel, and all auxiliary equipment is furnished – including a gin pole tall enough to handle a joint of tubing if necessary. Thus, workover jobs can be done without moving in a complete rig.





Control Panel includes weight indicator and may be spotted at any convenient place.

Hydraulic Power Supply may be located 100′ from well for greater safety.

Some of the many operations you can perform under full pressure control with this versatile, money-saving unit:

1. Plugged pipe may be pulled, repaired and re-run.
2. Outside or inside cuts may be made to remove sections of pipe which have developed holes or become stuck.
3. You may wash over stuck pipe.
4. An overshot may be run to pick up pipe which has been dropped.
5. A packer may be run or pulled under pressure.
6. A packer or retainer may be pulled safely while it swabs the hole.
7. Pressure controls may be installed on a drilling well when extra high pressures are anticipated.
8. Sand bridges may be drilled out under pressure.
9. Parted tubing may be repaired under pressure.

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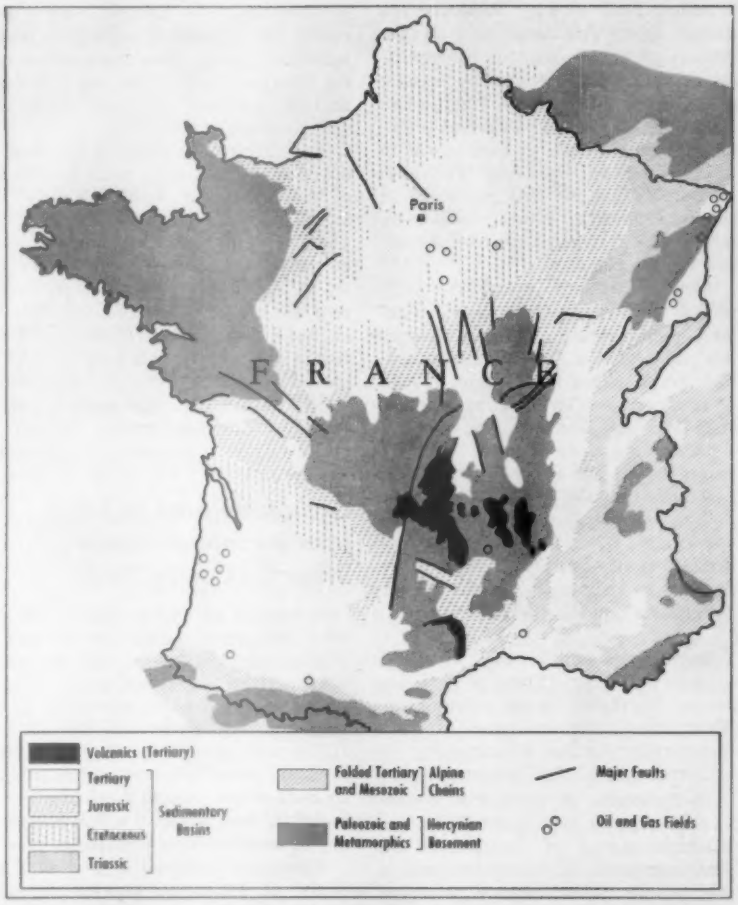


THIS GEOLOGIC MAP OF FRANCE shows the various basins and regional mountain chains of one of the relative newcomers to oil industry interest. There is production in five of France's basins.

Valley out into the Adriatic Sea into Albania. Miocene and Pliocene rocks may exceed 30,000 ft. It is here that Italy's many gas fields lie.

7. Aquitaine basin. This southern France basin lies just north of the Pyrenees. Here lies Parentis field, one of the biggest in Europe.

8. Paris basin. This French basin has just recently come into its worth as a big oil producer. Metropolitan France's biggest discoveries of late have been here. It remains as one of the promising areas in which to look for oil in Europe.

Europe's current oil output

(Thousands of barrels)

	June 1960	June 1959	
Total	287.8	258.6	+29.2
W. Germany leads with...	106.9	100.7	+ 6.2
Austria next with...	46.0	46.4	− 0.4
France	39.5	32.1	+ 7.4
Others	95.4	79.4	+16.0

Other minor basins that need drilling are the Upper Rhine Graben, Sicilian Central, Duero-Ebro, Transylvanian, Thuringian, Portuguese, Seville, and Tajo. Exploration has only begun in Europe. As in all virgin oil areas, Europe needs wildcats.

Recent exploration. The search for oil in western Europe last year landed 28 new oil fields and 22 gas discoveries for the continent. France and West Germany led the wildcat race with 6 new oil finds and 21 oil and gas fields, respectively.

Exploratory work was scattered throughout Europe, but the Paris basin and the North German provinces bore the brunt of most exploration and development. Nearly every one of Europe's 17 basins saw drilling action.

Molasse. The first important oil field for this Austrian basin was opened when Ried 1 Rohoel Gewinnaungs A.G. found oil in the Upper Eocene sand at about 1,400 ft. Pay

Production in western Europe

	1959	Cumulative
Austria	17,211,488	264,475,337
France	11,774,900	78,744,140
Germany	36,229,582	305,600,498
Italy	11,318,100	39,542,389
Netherlands	12,251,461	85,841,963
United Kingdom	628,309	9,115,017
Yugoslavia	4,358,843	22,845,491
Total	**93,772,683**	**806,164,835**

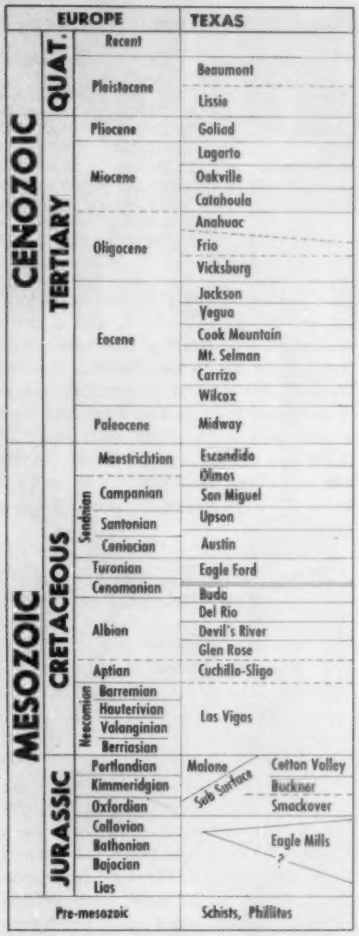
was 2-5 m. thick. Subsequent drilling of the Ried 2, 3, 4, and 5 wells outlined an oil-bearing structure 4 km. long and 1 km. wide. Seismic surveys in the area suggest a possible extension of the field to the west and east. Production at the wells, depending on thickness of pay, ranges from 70-300 bbl. of clean oil daily. The trap is formed by an antithetic north-dipping fault.

France. This was the big year for wildcatters in Metropolitan France. An important new field was opened in the Paris basin at St. Martin de Bossenay. Production is from Middle Jurassic limestone. The field was opened by COPESEP on a north-trending faulted seismic structure northwest of Troyes. Operators took the well to 2,396 m. into the basal Jurassic. They then plugged back for completion in lower Callovian basal Upper Jurassic to upper Bathonian upper Middle Jurassic limestone. Seven field wells have been drilled, four of which were good producers. Production is 940 bbl. per day from five wells.

The Esso-REP group gave the Aquitaine basin its most important oil field since Parentis. Cretaceous production was opened at Cazaux. Earlier this year a gas discovery by RAP at Charlas promised a possible west extension to production at St. Marcet gas field. The Cazaux well, 20 km. north of Parentis, is producing 32°-gravity oil in the Albian and Aptian sands between 2,264 and 2,500 m. Three extension wells were successful. The sands are discontinuous and the pay is a multiple sandstone reservoir. Daily output from four wells is 1,383 bbl.

Major French discoveries of late are: Paris basin: St. Martin de Bossenay, Montmirail and Villemer; Aquitaine basin: Casaux and Charlas; Sahara: El Gassi, Bordj Nil, Hassi Mazoula, Ouan Taredjel, Djebel Onk, Ohanet, and Erg El Agreb; Senegal: Diam Niade.

Germany. Oil-hunters here found 14 new oil and 7 new gas fields. Most of these are extensions to older fields. Of the 14 discoveries in northwestern



GENERALIZED CORRELATION CHART of Europe as compared with the South Texas formations in the U. S.

Germany, 12 were near already-known reservoirs or on large structures where oil was expected. There are 97 oil fields and 23 gas fields on production in Germany. Production increased 11% in 1959, to 99,250 bbl. per day. Pays in the area consist of Lower Cretaceous Valendis and Wealden, Upper Jurassic Malm, Serpulite, Gigas, Kimmeridgian, and Corallian Oolite, Middle Jurassic Dogger, Lower Jurassic Hettangian, and some sands in the Rhaetic and Keuper Upper Triassic zone. Gas pays are mainly dolomite members of the Zechstein Permian in northwestern Germany, and Tertiary in the Upper Rhine Valley Graben basin and the sub-Abilene region. Chief drilling targets are the Upper and Middle Jurassic and the Zechstein Permian. There is scattered drilling into the Lower Cretaceous and basal Jurassic-Rhaetic zones.

Remote exploration features German drilling. Last year a wildcat found thick potential reservoir sands in the Wealden southeast of Emden in a little-drilled area. Wildcats are drilled mostly on structures on the borders of known Jurassic troughs or on structural highs found by seismic methods within basins. Salt-dome flanks are also getting a careful study. Of high importance to future drilling in Emsland are the four Zechstein discoveries and the first gas strike in the Buntsandstein Lower Triassic—a new strike at Weser-Ems and a shallow field in Emsland.

Development of anticlines, peripheral fault systems, salt plugs, angular unconformities, and facies changes has resulted in a great variety of oil-field traps within the Gifhorn trough of northwestern Germany. Many other such traps still await the drill.

Other areas of Germany that are being drilled are the North German Lowlands and the Molasse basin, the Solling, Hessian, and Swabian-Franconian Jura basins. There is scattered drilling in the Saar-Nahe region, upper Rhine Valley, and in the Alpine Foreland along the Iller River.

Italy. There were 80 wildcats drilled in Italy last year. The Robecco discovery highlights recent events here. Though not a big producer, it is very important to further drilling along the northwest side of the Apennines.

In Peninsular Italy, the Ferrandina-Grottole gas-field discovery in the Bradanic trough of Lucania, is the first commercially important find in this region. Main reservoir is Upper Cretaceous limestone. Gas reserves of the main reservoir have been set at 300,000 M.M.c.f. Structure is a buried hill.

Sicily. Nearly 100 years went by before oil was found on this Italian island. Now there are two major oil fields—Ragusa and Gela. Gela is on the western depressed edge of the Ibleic plateau, located on a Mesozoic anticline. The main reservoir is formed by fractured and porous Triassic dolomites. Pay is at 3,150 m.

Ragusa is one of Europe's largest oil fields. Proved reserves stand near 150,000,000 bbl. Total production since 1954 is more than 19,000,000 bbl. The field structure is an asymmetrical anticline located in a foreland area. Pay is a Triassic dolomite—the Taormina.

Yugoslavia. Two basins of interest exist here—the Panon and the Adriatic. The Panon basin is a series of local grabens—the Sava, Drava, Mura, and Banat. Oil and gas come from the Miocene and Pliocene sands. Fifteen oil fields and five gas pools have been tapped in the nation since World War II.

The Adriatic region of Yugoslavia is made up of the Dinaric Alps, consisting of Mesozoic and Paleogene sediments. Seeps have been found in the Mesozoic rocks. The area is being actively surveyed by both geologic and geophysical parties.

A discovery was made at Ferdinandovce in the Pitomaca area southeast of Virovitica in the middle Drava Valley. Three oil zones were reported at 2,000 m. In Serbia, geological and geophysical work of previous years, led to the discovery of a new oil field near Elemir in Voyvodina, northwest of Boka field, Banat Province. The first well made 70 bbl. daily at 1,590 m.

Data from AAPG July Bulletin, 1960, and The Oil and Gas Journal.

—John C. McCaslin

Gas-condensate strike nearly connects Texas' Wharton County fields

A wildcat off the northeast end of West Bernard field and only 1½ miles west of the east end of East Bernard field, both in Wharton County, Texas Gulf Coast, has been completed as a small gas-condensate well.

The well, drilled by R. J. McGalliard, is classed as an extension of the latter field but suggest a possible linking of the two areas. It is 3 miles west of the town of East Bernard.

Open-flow potential is rated at 800 M.c.f. of gas daily. Gas-liquid ratio is 48.6 M.c.f. per bbl. Liquid is a 49.8°-gravity condensate. Production is from perforations at 7,495-7,523 ft. with bottom of the hole at 7,851 ft.

Location is on the operator's Leveridge lease in the John F. Stephenson League.

Gas discovery reported in Rush County, Kansas

Northern Rush County in Kansas has new gas production at a Lario Oil & Gas Co. wildcat, the 1 Basgall in NE SW SE 5-16s-17w.

A drill stem test at 3,530-45 ft. got 2 M.M.c.f.d. in 15 minutes. stabilizing to 1,600 M.c.f.d. Production is from the Arbuckle Cambro-Ordovician. Location is 2½ miles east of North Herr field and the same distance northwest of North Loretto field.

Ellis County. Frontier Oil Co. 2 Lang is a new pool discovery well in SE SE NE 19-13s-20w, 1½ miles southeast of Ellis.

The well made 30 bbl. of oil per day from Arbuckle pay at 3,874-80 ft. This well opens Southeast Herbert field.

Drillers keep trying in Northwest

DRILLING activity for Washington and Oregon thus far in 1960 has produced seven dry holes and a "near new-field discovery." Three rigs are currently active in the green-timbered areas of Washington and Oregon. Hopes are still high that current action will unlock the oil and gas secrets in the two state area before torrential downpours dampen this year's exploratory efforts.

Oregon. Humble Oil & Refining Co. is drilling below 12,000 ft. on its 1 Thomas Creek, Lake County, Oregon test. The operator is not releasing formation dope, but the well has reportedly found an abnormally thick section of Lower Tertiary volcanics. The operator shortly will be faced with the decision of deepening and running an expensive protection string or abandoning and trying a new location. Humble has a reported 500,000-acre block covering a major northwest-southeast anticline centering near Lakeview, Ore., and extending across the Oregon line into Modoc County, California.

In addition to the Humble activity, it appears likely that upper Eocene Marine objectives in the Williamette Valley again will be looked at by one or two tests before the end of the year. Many will remember the short-lived Williamette Valley flurry of December 1958, when the Linn County Development Co. reportedly developed an oil show in a 20-ft. sand near 4,000 ft. in the company's 1 Barr. While the reported show drew considerable interest from major company scout and land personnel, the well when tested failed to give up more than a weak "puff." In spite of the negative results, the reported "show" promoted considerable land activity by major companies and still contributes to exploratory interest in the valley.

Washington. Sunshine Mining Co.-Cascade Natural Gas Co. is currently drilling below 5,000 ft. on its 1 Oscar, an important southeast extension to the Ocean City field, Grays Harbor County, where Sunshine completed the state's first oil well in 1957 (current prod. ±3 barrels per day) and last year completed a possible new pool gas well, currently supplying small amounts of gas to a nearby resort. Information other than routine data is not being released by the operators, although it is known that several drill-stem tests have been run. More information will probably be released after the State of Washington's auction of offshore state-owned lands lying adjacent to Ocean City field.

Sunshine and Cascade are currently trying to complete their Rayonier 1-A, approximately 12 miles north of Ocean City field near Aloha. The operators drilled to a total depth of 6,500 ft., plugged back and ran production casing to 4,733 ft. Good shows of oil and gas were encountered between 3,300 and 4,700 ft. during drilling. The operators have been plagued with mud-plugged tubing but on several short-duration production tests oil flowed at estimated rates of 5-9 bbl. 40°-45° oil. This well could develop into an important new field discovery and is being closely followed by West Coast oil companies.

C. & D. Mineral & Development Corp., Lincoln County, is drilling near 5,000 ft. on its 1 Basalt, a planned 5,000-ft. Columbia River Basalt test. The well is located near Odessa in the Columbia basin.

Texas' Matagorda continues to click

Matagorda County, in Texas' upper coastal district, is keeping up its rapid succession of discoveries in its prolific deep Frio sands.

Latest is a dually completed well by Texkan Oil Co. 5½ miles north of Palacios. It is west of the north end of the expansive multipay Palacios field, and more than 2 miles northeast of Southwest Pheasant field, opened last year.

The new dual discovery well, 1 W. A. Elder, is productive of gas and condensate from both zones, one perforated at 9,205-9 ft., and the other at 9,294-98 ft. Hole was drilled to 9,367 ft.

Open-flow potential from the shallower pay is 15,200 M.c.f.d. of gas daily. Gas-liquid ratio is 21 M.c.f. per bbl. Liquid is a 57°-gravity condensate.

The lower pay tested for an open-flow potential of 9,200 M.c.f.d. of gas. Ratio is 19 M.c.f. per bbl. Gravity of the condensate is 56.7°.

About 6 miles northeast in the recently opened Ashby field, Lloyd H. Smith, Michael Judd, and United Producing Co. have completed their second well in a slightly shallower sand than that in their discovery well.

Their new well, southwest of the discovery well, is completed with perforations at 10,834-39 ft., 10,841-46 ft., and 10,858-66 ft. Testing through 10/64-in. choke, it flowed 2,250 M.c.f.d. of gas with pressure of 4,100 psi. There is no gage on liquid recovery.

Discovery well, 1 Alderman unit, completed last March is productive of gas and condensate from sand at 11,078-90 ft. This area is 4 miles northeast of Palacios field, and 4½ miles southeast of Blessing.

New Mexico gets remote gas production

SMALL gas production is reported at a remote Northwest New Mexico wildcat. Great American Oil & Gas Co. 1 Sargent, 4-1s-2e, Tierra Amarillo Grant (33-31n-3e), northeastern Rio Arriba County, flowed 500 M.c.f.d. on tests of the Entrada Jurassic at 960 ft.

This well spots about 30 miles from nearest production in the San Juan basin. The operator is now drilling a second well in the immediate area.

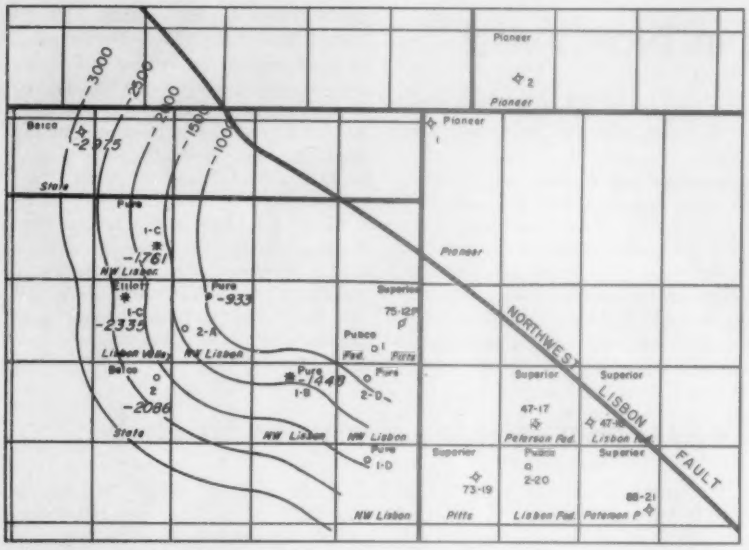
Southeast New Mexico. One of the most important Abo reef discoveries yet is Standard Oil Co. of Texas 2 Vacuum Edge unit about 20 miles northwest of Hobbs in southwestern Lea County.

The well is completed flowing 240 bbl. of 40°-gravity oil per day on potential test through ½-in. choke. Production is from perforations in the Abo reef at 9,650-9,720 ft. Location is on the south edge of Vacuum field in 4-18s-35e.

Ohio adds four Wayne County successes

In Ohio, four more oil successes were added on the east edge of Moreland pool in Franklin Township, Wayne County.

Clinton sand production after fracture of 6, Section 6 and 9, Section 3, R. J. Dial, tested 170 bbl. and 130 bbl. respectively. The 4, Section 3, deepened from the Newburg horizon, pumped 180 bbl. in 24 hours. The operator, Preston Oil Co., also finaled 9 Raymond Baker, Section 3, as a 170-bbl. producer. Total depth of the Clinton in this area is about 3,950 ft.



THIS MAP of the Northwest Lisbon anticline in San Juan County, Utah, taken from the new Four Corners Geological Society Guidebook of the northern Paradox basin, shows the five wells drilled to date. Lisbon field is considered the most important Rocky Mountain exploratory event since Aneth.

New book released on Four Corners

The Four Corners Geological Society, Box 1121, Durango, Colo., has just released the most timely and complete geological publication to be released by the group yet. The volume, "Geology of the Paradox Basin Fold and Fault Belt," is directed almost exclusively toward a better understanding of the northern Paradox basin, scene of Pure Oil Co.'s famed Lisbon development.

Major shift. This major oil and gas discovery of late last year caused the shift of the Four Corners area oil industry's exploration effort to the salt structure region of the northern part of the Paradox basin. This shift created an immediate interest and demand in the geological world for reliable geological data concerned with this area. There were surface maps, everyone knew the salt structures were there, a few deep tests had been drilled, and almost as many theories of salt-structure formation as there are geologists could be found. The Four Corners Geological Society organized a field trip through the area and published a guidebook containing papers written by recognized local and national authorities on the problems faced in this region and the geology of the salt structures.

Attention focuses on Alberta's Simonette

ALBERTA'S Simonette River region is once again being watched very closely by the oil and gas industry in western Canada.

When oil was discovered in the D3 reef in the region almost 3 years ago it was thought that a major pool had been uncovered. While the field has now increased substantially in size a number of stepout failures have indicated that the major status attributed to it was somewhat premature. However, a pair of recent developments on the west side of the field have indicated another pair of producing horizons with sizable potential. In addition to those developments another well 5½ miles west of the actual producing sector has just now reached a separate reef structure and initial indications are promising although drill-stem testing of it has up till now failed.

Wabumun. One of the more important features of this area is the occurrence of a wet-gas sector in the Wabumun, or D1 horizon. It occurred first in the Shell-Petrol 12-26 Simonette venture, 2 miles south of D3 reef production. The well kicked off flowing 3,580 M.c.f.d. and for every 6,027 cu. ft. of gas produced 1 bbl. of condensate was recovered—or a rate of 593 bbl. per day. Another well 2½ miles northwest of that strike was recently tested in the same horizon and found even a richer section.

The new success, Shell-Petrol-Explorers 12-2-63-26 Simonette, on LSD 12, 2-63-26w5, is ½ mile west of the Shell 10-2 Simonette D3 reef oil success and is the most westerly well yet drilled in the field area. In addition to extending the Wabumun wet-gas sector in that direction it also found a 70-ft. pay sector in the reef. However, indications are that Shell will place the well on production from the D1 horizon, as it tested 4 M.M.c.f.d. and gave up the equivalent of 800 bbl. of condensate per day.

The other recent development in the district was at a previously abandoned hole drilled some 3 miles west of D3 production by Western Decalta Petroleums, Ltd. That venture found a tight reef section and was consequently abandoned. After making a study of the logs, etc., it was decided to open the venture up once again and retest the Cadomin structure. In so doing a substantial gas flow was recorded and it is understood that casing will now be run in the well, Decalta et al. 16-4-63-26 Simonette. Actual flow rates during secondary tests have reached 12 M.M.c.f.d. from a comparatively shallow section around the 8,100-ft. level.

Another well is being drilled by Richfield Oil Corp. 5½ miles west of Simonette field and 3 miles west of the Decalta well. This venture, Richfield Sinclair-B 10-1 Simonette is coring around the 12,300-ft. level and one test already attempted in the D3 reef has failed due to packer leakage. However, it is expected that further testing will be done soon and therefore this well should be watched very closely.

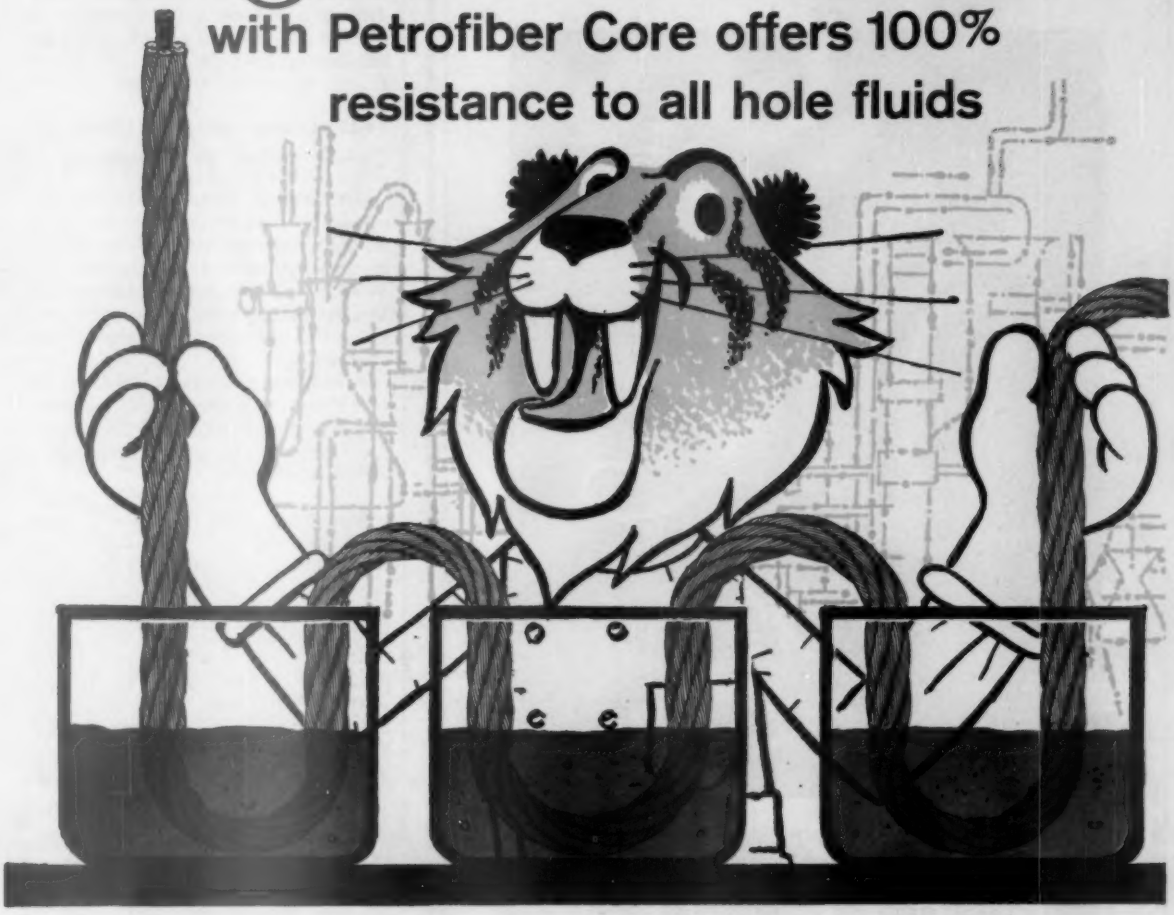
No matter what happens at the Richfield hole, however, the two recent successes should spur even further drilling in this district and the Wabumun section in particular could emerge as even a better productive sector than the D3 reef.

Arkoma will see more drilling action

More exploration is slated for southeastern Oklahoma's Arkoma basin. Kentucky Drilling & Development Corp. will take 1 Bailey to 3,000 ft. on the Potato Hills uplift in Latimer County. Location is 4 miles northwest of Albion in NW SW NW 31-3n-21e.

This new wildcat is a south offset to an old gas well in SW SW SW 30. That 1916 well had gas at 2,305 ft. with total depth at 2,655 ft. Location is 5 miles east of this year's Sinclair Oil & Gas Co. gas discovery at 1 A. H.

New USS Tiger Brand well-servicing line with Petrofiber Core offers 100% resistance to all hole fluids



Petroleum has come back to serve the well-drilling and servicing industry. The Petrofiber core of this improved line is made of synthetic fibers which are derived from a new group of petrochemicals, polypropylene by name. This material has superior qualities for cores of swabbing lines, sand lines, coring lines and cable-tool drilling lines.

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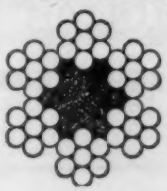

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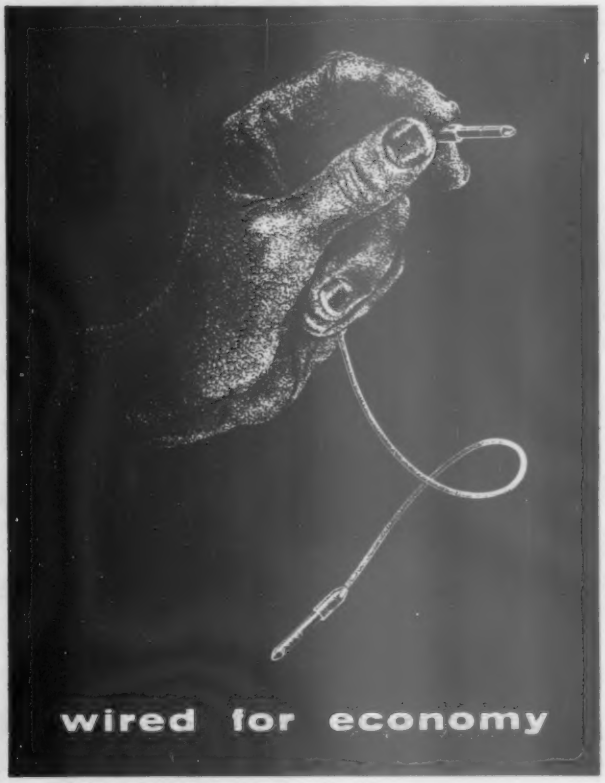

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Reneau, 32-3n-20e. That well flowed 1,850 M.c.f.d. from Big Fork chert at 2,340-2,410 ft. Sinclair is also drilling a wildcat at 1 Coussens in SW SW SE 21-3n-21e. They will take this one to 2,500 ft.

Tests under way at Wallace Creek strike in Wyoming

The Wallace Creek Muddy discovery in Natrona County, Wyoming, is testing. National Cooperative Refining Association 1 Unit, SE NW 22-34n-87w, 12 miles northwest of Muddy Grieve field, flowed 131 bbl. of oil in 18 hours through ¼-in. choke.

Production is from perforations at 10,345-61 ft. in the Muddy zone of the Thermopolis shale of Cretaceous age. Operator is now testing on a 24/64-in. choke.

State Line. Gulf Oil Corp. 9 State Line unit, NE SW 3-12n-94w, Sweetwater County, is flowing oil from casing notch at 3,249 ft. Gage was 13 bbl. in 3 hours through 22/64-in. choke and 585 M.c.f.d. Other gages made as much as 40 bbl. in 3 hours through 22/64-in. choke. Production is from Fort Union Tertiary. This is a northwest extension to the 8 Unit Fort Union gasser in NE NE 9-12n-94w. That well flowed 6,250 M.c.f.d. from perforations at 4,298-4,316 ft.

Powder River basin. Drilling will pick up around the new Muddy Newcastle discovery in Crook County. Rio Oil Co. and Continental Oil Co. 1 Federal-Lewark in SW NW 6-53n-68w pumped 271 bbl. of oil per day from perforations at 5,307 to 5,328 ft.

One location is already announced. Pan American 1 Zimmerschied, NE NW 6-53n-68w, a northeast offset try, is waiting on rotary.

Michigan wildcat tests shut down

THREE wildcat tests, all presumed to have reached 5,000 to 6,000 ft. to test through the Trenton, have been idled or plugged in far northern Michigan, first Trenton tests to follow the big land play that swept the north end of the lower peninsula last spring.

The three tests were drilled by Forrest H. Lindsay of Tulsa, one of the many outstate independents who have taken a fling in Michigan the past 2 years. Lindsay held a tight lid on all information during the drilling of the tests, located in Antrim Leelanau, and Presque Isle counties. As rigs were stacked on all three this week Lindsay

exercised his option with the Conservation Department to hold even plugging information from the public.

A new 1960 drilling depth mark of 6,851 ft. was set at Holly Oil Co. 1 Nelson, C NE NE 9-4n-7e, Oakland County, beating the previous year footage by 35 ft. It was the deepest test drilled in the state since a 9,128-ft. test in Tuscola County drilled in 1956. Holly logged Trenton at 5,866 ft., dry, compared to 3,400 to 4,000 ft. on the Scipio trend.

Crude-oil production from wells on the Scipio-Albion trend continued to climb in September, the proration division of the Conservation Department reported. Runs totaled 778,973 bbl. from 291 wells compared to 763,943 bbl. from 274 wells in August.

Oklahoma linkup well flows at high rate

A Major County linkup discovery is Cities Service Oil Co.'s 1 Cities Service "B" in C SE NE 7-21n-14w, northwestern Oklahoma. The well flowed 294 bbl. of oil in 9 hours through 20/64-in. choke from Red Fork Pennsylvanian at 7,077-95 ft. The discovery offsets Cheyenne Valley field to the east and Northeast Cheyenne Valley field on the west.

Offset spudded in California's Kirk area

In California Occidental Petroleum Corp. is spudding in immediately an offset well to Western Gulf Oil Co.'s newly completed discovery gas well in the Kirk area of Sacramento Valley.

The new well, Occidental K-1 Zumwalt, is located approximately 2,000 ft. east of Western Gulf's wildcat 1 Goff-Erdman, which in a drill-stem test flowed through a ¼-in. choke for 63 minutes at a stabilized rate of more than 5 M.M.c.f.d.

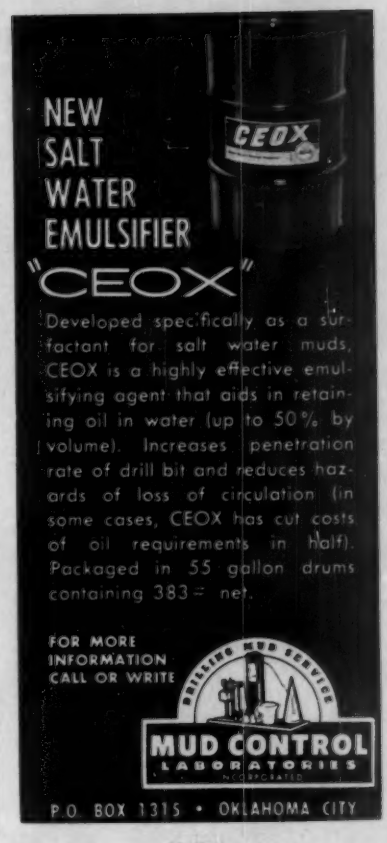
The Occidental drill site is in Colusa County on the southwest quarter of 14-13n-1e .

The company will test the F zone, which is currently producing gas for the company at Arbuckle. The well is expected to reach a depth of 9,000 ft.

Louisiana discovery being confirmed

DISCOVERY of Esther field, in Vermilion Parish, Coastal Louisiana, is being confirmed with the addition of two more productive horizons in a triple-zone well completed by Texas Crude Oil Co.

The well, 1 Lutgring Cristellaria 7 Unit 2, is 2,300 ft. northeast of the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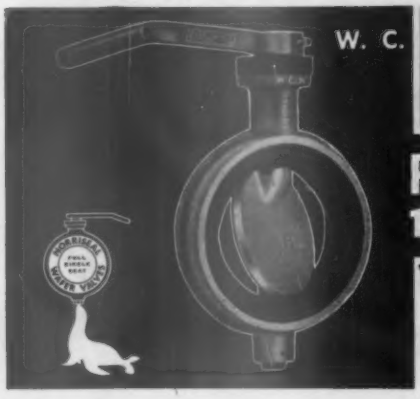

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Canada September completions

	TOTAL WELLS							WILDCATS					
	Total	Oil	Gas	Dry	Service	Footage	Cum. 1960	Total	Oil	Gas	Dry	Footage	Cum. 1960
Western Canada	**177**	**118**	**20**	**37**	**2**	**1,013,970**	**1,826**	**43**	**6**	**8**	**29**	**244,333**	**483**
Alberta	127	82	18	25	2	811,439	1,246	31	2	7	22	188,850	320
Saskatchewan	40	31	0	9	0	157,999	410	9	4	0	5	38,292	88
Manitoba	3	3	0	0	0	5,916	46	0	0	0	0	0	8
British Columbia	7	2	2	3	0	38,616	110	3	0	1	2	17,191	53
N. W. T.	0	0	0	0	0	0	14	0	0	0	0	0	14
Ontario	41	9	8	17	7	52,380	230	...	...	...	...	.....	....

field's discovery drilled by Southern Crude Oil Co. and others, and completed in July 1959.

The discovery well was productive of gas and 45.7°-gravity condensate from pay at 12,160-64 ft. The confirming well is perforated at 12,132-38 ft. in the same pay, flowing 1,560 M.c.f. of gas and 13 bbl. of 46°-gravity condensate per day through 9/64-in. choke. Its two additional pays are shallower, one perforated at 12,026-30 ft., and the other at 11,862-74 ft.

Flow from the latter, the middle zone of the three-pay well, tested 2,900 M.c.f. of gas and 59 bbl. of condensate per day through 10/64-in. choke.

The top zone flowed 37 bbl. of 43.3° - gravity condensate per day through 9/64-in. choke. Gas-liquid ratio was 56 M.c.f. per bbl.

New gas production for Texas' Jackson

New gas production has been opened in a wildcat discovery 7 miles north of Lolita, in Jackson County, on Texas' midcoast. It is about midway between North Texana field, 1½ miles west, and Hornbuckle field.

The discovery is by Texkan Oil Co. at its 2 R. M. Allnoch, in the H. W. Munson Survey. Flow tested for a potential of 17 M.M.c.f.d., recovery 61.6°-gravity condensate at the rate of 1 bbl. to 86,500 cu. ft.

Mississippi's Ovett reopens Lower Cretaceous pay

Lower Cretaceous production has been reopened in the Ovett area of Jones County, South Mississippi, with a small, pumping, heavy-gravity oil well a mile northwest of the field's present two Eutaw (Upper Cretaceous) wells.

The new well, pumping 43 bbl. of 8°-gravity oil with 82½ bbl. of water per day, is Ginther, Warren & Co. 1 Holifield. Its pay is in the Washita-Fredericksburg section, perforated at 8,984-9,016 ft.

Only other Lower Cretaceous production was the discovery well, completed in 1948 with pays in the Lower Rodessa, Paluxy, and Mooringsport horizons at depths ranging from 12,011 ft. to 13,082 ft. It was reworked in 1952 and recompleted in the shallower Eutaw sand.

Louisiana field stretches northwest

New gas-condensate production has been found in a long stepout northwest of South Humphreys field, in Terrebonne Parish, southeastern Louisiana.

Bateman Drilling Co. 1 Continental Land & Fur Co. flowed at the rate of 2 M.M.c.f.d. of gas through 10/64-in. choke from perforations at 10,689-10,710 ft. Condensate (41°-gravity) yield was ungaged. Ratio was 5 M.c.f. of gas per bbl. of liquid.

It is nearly a mile from production at South Humphreys, a one-well gas-condensate field opened in 1956. Its pay is at 12,500 ft.

Bateman's well was drilled to 12,802 ft. Its flowing pressure registered 4,100 psi.

Texas Brazoria adds prolific oil find

A PROLIFIC oil discovery has been made by General Crude Oil Co. a mile west of the huge, deep multiple-pay Chocolate Bayou field in southeastern Brazoria County, Texas.

Flow of 424.26 bbl. of 39.8°-gravity oil per day through 12/64-in. choke was recorded for completion gage. Flow was under pressure of 3,250 psi. with gas-oil ratio of 1,332 cu. ft. per bbl.

Production is from Frio sand with pay perforated at 12,598-12,610 ft. Total depth is 13,441 ft.

Location of the well, 2 Houston Farms Development Co., is 1½ miles southeast of Chocolate Bayou townsite.

Discovery Wells

WESTERN CANADA

Alberta:

Hudson's Bay-Canadian Pacific 6-28 Wintering Hills, LSD 6, 28-25-18w4. Basal Quartz oil discovery. TD 4,606 ft.

British-American 2-34 Vincent Lake, LSD 2, 35-48-10w4. Colony gas discovery. TD 3,177 ft.

COLORADO

Washington County:

Kimbark Exploration Co. 1 McFall-State, C SE SW 36-1s-56w. IPP 26 BO, 105 BWPD, "D" sand 4,983-89 ft. TD 5,130 ft. "D" sand discovery, new field.

MICHIGAN

Hillsdale County:

Bell & Gault Drilling Co. 1 Young, NE NE NW 11-8s-1w, Wright Township, 15 miles southeast of south end of Scipio trend. AIP 24 BOPD, pump. Elev. 920, Trenton 2,864, Black River 3,132, Glenwood 3,437, Prairie du Chien 3,456, pay 3,458-66. TD 3,467 ft. New oil discovery.

MISSISSIPPI

Calhoun County:

Gulf Oil Corp. 1 Reid, SW SW SE 26-12s-1e. IP 1,084 M.c.f.d., dry gas, 20.12 BWPD, open flow, TP 109 psi., perf. 3,398-3,404 ft., Mississippian-Abernathy sand. TD 4,227 ft. New-field discovery in Black Warrior basin.

Jones County:

Ginther, Warren & Co. et al. 1 V. L. Holifield et al., NE NE SE 18-6n-11w. IPP 43 BOPD, 82½ BWPD, 8°, perf. 8,982-9,000 ft., Washita-Fredericksburg. TD 13,031 ft. Elev. 244 ft., Lower Cretaceous 8,938 ft., first Rodessa sand 12,782 ft. New pay, and extends Ovett field 1 mile northwest.

Wayne County:

George Harrison et al. 1-26 U.S.A. IP 108 BOPD, open, 42.4°, GOR 600 cu. ft. per bbl., TP 0, perf. 11,917-27 ft., Hosston, TD 12,907 ft. New-field discovery.

NEBRASKA

Cheyenne County, Rohlfing:

Ohio Oil Co. 1 Rohlfing, NE SE NE 11-12n-52w. IPP 117 BOPD, 39.2°, "B" sand discovery, new field. TD 5,250 ft.

Kimball County:

Chandler & Simpson 1 Larson-B, C SW NW 12-15n-56w. IPP 240 BOPD, "J" sand discovery, new field. "J" sand 6,420 ft. TD 6,462 ft.

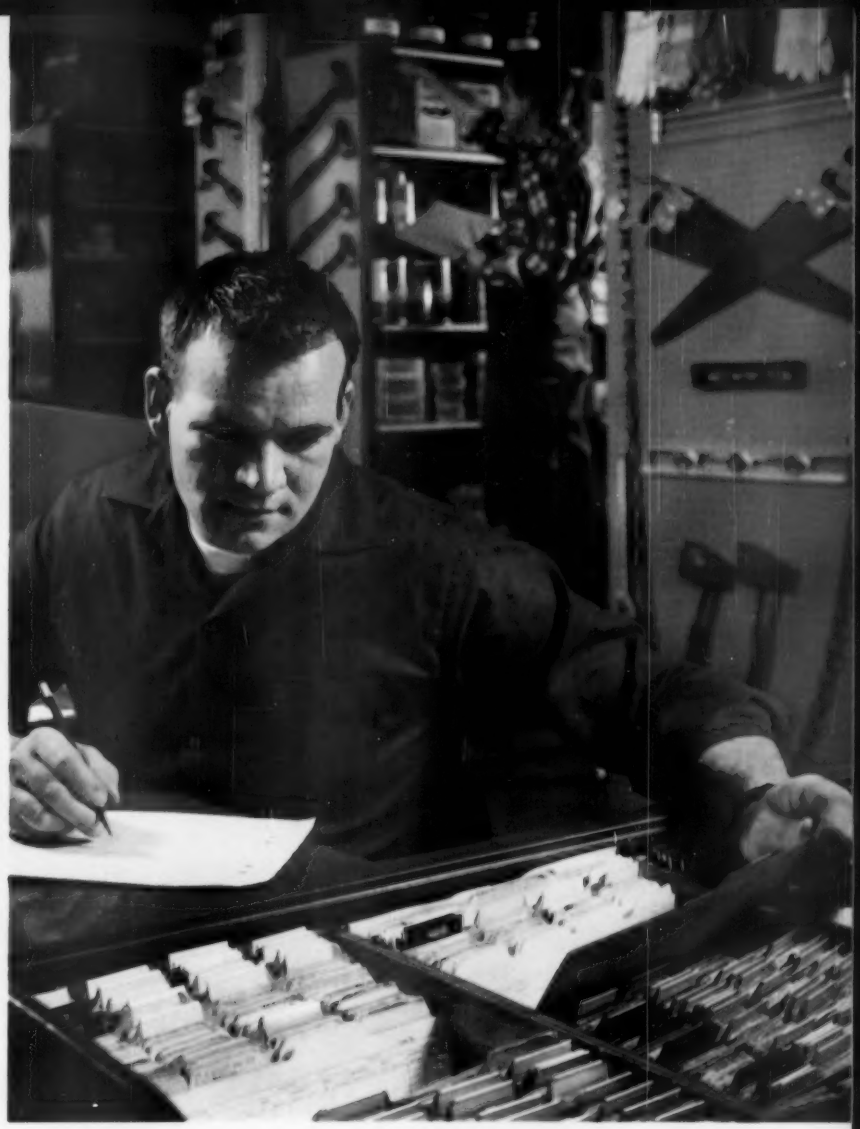
Redwillow County:

Franco-Central Oil Co. 1 Fritz, C NW NW 1-2n-27w. IPP 95 BOPD, Reagan sand discovery. New field. TD 3,551 ft.

NEW MEXICO

Rio Arriba County:

La Plata Gathering System 2-26 San Juan



When rig-up starts . . . a stock check-up starts here

When you move a rig to a new location, folks in the nearest National Supply store go into action to *help you reduce down-time!*

This job calls for STOCKING vital parts that you might need in a rush . . . and DOING this job calls for a constant check of inventory to spot any gaps, and then ordering all items required.

This isn't all of the story, by any means. If any unanticipated breakage occurs, an immediate check is made with other stores in the district to find out where the necessary part can be obtained most quickly. Our nationwide teletype network lets us check availability with all 120 outlets.

The stocking of repair parts is only part of National Supply's store service. We purchase equipment and supplies from thousands of different sources—but all items have one thing in common. Every product we handle is trade-marked with the brand of established, reputable manufacturers, such as Byron Jackson, Chiksan, Ray-O-Vac and Clayton Mark.

Read about National Supply pump products on next pages

All National pumps are thoroughly inspected and tested before shipment. Photo shows new H-1250 pump undergoing extensive testing at National's Gainesville, Texas, pump test stand. This test stand is capable of transmitting up to 1400 input horsepower.

HOW TO REDUCE MUD SYSTEM

H-1250. National's engineers used new approach in designing power end frame for H-1250 slush pumps. Streamlined, strengthened box-type unit will withstand all pressures of severest service. Unique design features result in reduced cylinder bore wear, longer liner packing service, longer life for connecting rod and main bearings, fast and efficient lubrication.

K-500. This completely new 513 input horsepower slush pump provides a high degree of accessibility which simplifies and speeds up routine maintenance operations. "Fast change" screw type valve covers and threaded cylinder head arrangement permit rapid removal of all fluid end parts, without removing cylinder head body. Write for new Bulletin No. 500.

New National H-1250 Power Slush Pump combines high strength with light weight, compactness

Advanced design of National's H-1250 power slush pump meets all requirements of modern jet drilling. Yet all features retain the durability that is traditional in National Supply pumps.

Here are a few of the H-1250 features that pay off in long, trouble-free service:

LIGHT WEIGHT. Main frame is fabricated of formed steel plates, structurals and castings, welded in a tight unit with high structural rigidity. The H-1250 is very portable, due to light weight in relation to its 1,250 input horsepower.

LONG PACKING LIFE. Liner and cylinder head packing last longer . . . can be independently adjusted without disturbing metal-to-metal fluid cylinder liner arrangement. New dual cage fluid end design reduces cylinder bore stresses.

IMPROVED FATIGUE LIFE. Reduction in cylinder bore stresses is achieved as new design reduces by nearly one half the length of the bore exposed to fluid pressure.

It will pay you to investigate the many new features of National's H-1250 slush pump. Write for Bulletin No. 502, or call your nearest National Supply representative.

Steel

Steel's Symbol of strength, long life, and economy

National Fluid End Parts on next page

COSTS WITH NATIONAL PUMPS

K-700. This new National power slush pump is exceptionally light in weight for the 700 input horsepower rating. Design incorporates same fluid end innovations as the K-500. Fluid end is a one-piece steel casting with streamlined internal passages. Cylindrical sections give maximum strength. Each fluid end is given a thorough hydrostatic test before final assembly. Write for new Bulletin No. 501.

PULSATION DAMPENERS. The National Pulsation Dampener is made without troublesome rubber diaphragms, bags or sleeves. Only rubber element is an inexpensive valve disc that can be replaced in minutes. Rig air supply operates the dampener without need for high pressure air supply or nitrogen for pre-charging. National Pulsation Dampeners are available as original equipment or for field installation.

Careful packaging and shipment of National Fluid End parts assure delivery in factory-perfect condition.

National Fluid End Parts are readily available when and where you need them

National Supply has utilized its facilities and experience as a leading pump manufacturer to develop a complete line of fluid end parts for your use. Every part meets the most exacting quality standards.

DUAL SEAL PISTON

Incorporates two replaceable piston rubbers, forming an inner and outer seal at each end of the piston. Void between the rubbers allows space for displacement, minimizes damage to piston lips as it enters liner. Heavy fabric section molded into the back of inner rubber dams off extrusion around the OD of hub, and reduces pinching of the rubber. Forged steel hub of piston resists expansion under extreme loading.

FLUID PISTON ROD PACKING

Fluid pressure actuates the sealing lips. The greater the pressure, the tighter the seal . . . yet the solid make-up through the body of the packing minimizes the danger of overtightening it when it is installed. Rod wear is sharply reduced, because lip pressure is never excessive . . . in fact, it is negligible on the suction stroke.

FLUID CYLINDER LINERS

The ID of the Nationaloy Liner is case hardened throughout its length. Precision honing gives it maximum resistance to wear, washing and abrasion. Outside surface is machined to close tolerances, promoting closely controlled fits which reduce piston and rod wear due to misalignment.

FLUID CYLINDER LINER PACKING

Resistant to oil, gas heat and chemicals, National Liner Sleeves provide a perfect seal between the liner and pump bore. They are sufficiently hard to be confined in the packing space . . . preventing excessive flowing and pinching . . . yet they retain ample resiliency for proper sealing action.

"BLUE STRIPE" AND "BLUE CHROME" PISTON RODS WITH API TAPERS

Have maximum tensile strength and high resistance to impact. Precision ground and polished to reduce wear of both packing and rod. "Blue Chrome" Piston Rods have a super-hard, abrasion-resistant chrome finish which gives added packing and rod life under all conditions.

TYPE G-2 FLUID VALVES AND SEATS

Promote maximum pump efficiency, with maximum effective opening for fluid flow to permit complete filling at high speed. The lower guide . . . integral with the valve . . . has a large contact area which reduces wear and minimizes the possibility of cocking. A heavy clamp plate and lock gives longer valve life.

THE NATIONAL SUPPLY COMPANY

Two Gateway Center, Pittsburgh 22, Pennsylvania

Subsidiary of Armco Steel Corporation

DIVISION OFFICES: Calgary, Columbus, Dallas, Denver, Houston, Torrance, Tulsa

EXPORT: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; City Wall House, Chiswell Street, London E.C. 1

Litho in U.S.A.

September footage report . . . in the U. S.

	FIELD WELLS					WILDCATS			
	Oil	Cond.	Gas	Dry	Service	Oil	Cond.	Gas	Dry
Alabama	11,332	.....	.....	.....	.....	.....	.....	.....	.....
Alaska	.....	.....	.....	.....	.....	.....	.....	14,019	9,034
Arizona	.....	.....	.....	2,114	.....	.....	.....	.....	.....
Arkansas	39,579	11,509	12,960	59,495	2,330	7,742	.....	5,709	24,118
California	288,658	.....	61,184	34,812	.....	8,871	.....	8,102	97,221
Colorado	37,498	.....	48,620	65,087	.....	5,130	.....	6,505	117,225
Illinois	142,076	.....	5,012	77,722	89,249	17,965	.....	.....	87,795
Indiana	64,666	.....	.....	41,645	.....	.....	.....	.....	30,124
Iowa	.....	.....	.....	.....	.....	.....	.....	.....	770
Kansas	440,352	.....	19,915	270,806	34,630	57,232	.....	47,209	232,469
Kentucky	15,769	.....	67,068	42,381	144,000	1,235	.....	130	30,327
Louisiana	865,648	315,207	135,410	511,296	4,656	11,167	40,076	.....	229,710
North	127,346	.....	87,023	110,095	2,824	11,167	.....	.....	75,843
South	550,245	222,387	48,387	304,272	1,832	.....	13,538	.....	153,867
Offshore	188,057	92,820	.....	96,929	.....	.....	26,538	.....	.....
Michigan	97,912	.....	847	44,913	66,501	.....	.....	.....	106,812
Mississippi	199,057	.....	13,385	85,525	.....	15,773	.....	.....	140,314
Missouri	.....	.....	.....	.....	.....	.....	.....	.....	2,990
Montana	68,517	.....	.....	34,169	.....	.....	.....	2,540	57,885
Nebraska	69,374	.....	.....	94,897	.....	16,903	.....	.....	110,779
Nevada	.....	.....	.....	.....	.....	.....	.....	.....	3,860
New Mexico	365,209	16,885	216,278	96,749	954	28,419	.....	.....	65,850
West	75,047	6,790	204,280	14,409	954	13,714	.....	.....	22,965
East	290,162	10,095	11,998	82,340	.....	14,705	.....	.....	42,885
New York	10,840	.....	8,930	3,933	7,997	.....	.....	7,875	8,103
North Dakota	77,057	.....	.....	31,233	.....	10,259	.....	.....	45,038
Ohio	123,175	.....	64,203	42,232	65,832	.....	.....	.....	10,341
Oklahoma	460,667	33,851	132,854	258,111	62,528	54,464	9,890	46,876	135,830
Pennsylvania	85,463	.....	189,475	66,329	74,338	.....	.....	11,095	17,868
South Dakota	.....	.....	.....	.....	.....	.....	.....	.....	3,610
Tennessee	.....	.....	.....	.....	.....	1,475	.....	555	14,552
Texas	1,857,674	532,137	274,440	888,110	75,389	113,846	16,113	16,310	793,207
Dist. 1	68,646	11,600	9,884	37,403	2,948	6,788	.....	5,410	58,564
Dist. 2	79,562	74,411	58,376	64,760	.....	4,445	7,015	.....	57,588
Dist. 3	100,152	62,037	27,566	169,303	.....	9,652	.....	.....	128,403
Dist. 4	62,987	79,434	77,157	94,622	4,117	8,566	.....	6,500	92,424
East	179,432	91,199	.....	84,778	1,160	11,300	9,098	.....	81,095
Dist. 7-B	176,553	25,025	20,073	107,771	5,558	17,155	.....	4,400	96,740
West	867,669	102,380	21,261	136,932	52,473	41,555	.....	.....	146,105
Dist. 9	247,213	23,063	.....	158,652	9,133	14,385	.....	.....	129,138
Dist. 10	75,460	62,988	60,123	33,889	.....	.....	.....	.....	3,150
Utah	11,909	.....	.....	8,621	.....	.....	.....	.....	36,213
West Virginia	18,790	.....	135,376	6,932	6,414	.....	.....	.....	.....
Wyoming	133,436	.....	24,739	19,641	.....	1,296	7,634	6,505	154,527
Total U. S.	**5,484,658**	**909,589**	**1,410,696**	**2,786,753**	**634,818**	**351,777**	**73,713**	**173,430**	**2,566,572**

. . . and in western Canada

Total	**658,596**	.....	**60,915**	**38,526**	**11,690**	**22,004**	.....	**60,178**	**162,151**
Alberta	538,840	.....	56,920	15,139	11,690	7,205	.....	54,386	127,259
Saskatchewan	104,872	.....	.....	14,835	.....	14,799	.....	.....	23,493
Manitoba	5,916	.....	.....	.....	.....	.....	.....	.....	.....
British Columbia	8,878	.....	3,995	8,552	.....	.....	.....	5,792	11,399

32-5, SE SE 26-32n-6w. IPF Dakota 3,389 M.c.f.d., ¾-in. choke, SITP 2,919 psi. Dakota 7,846-7,993 ft.; 4,177 M.c.f.d., ¾-in. choke, Mesaverde 5,436-5,760 ft. SITP 2,213 psi. Dual completion. TD 8,067 ft. Dakota discovery, new pool.

SOUTHEAST NEW MEXICO

Eddy County:

J. M. Welsh 3 Etz, 13-16s-30e, Henshaw field. IPF 150 BOPD, ½-in. choke, 35°, Lovington open hole 3,235-53 ft.; IPAOF 1,875 M.c.f.d., Penrose 2,682-98 ft. TD 3,253 ft. Dual oil and gas discovery inside field.

WEST TEXAS

Borden County:

Gulf Oil Corp. 1 B. S. Welton et al., 6 miles northeast of Gail in Sec. 23, Blk. 30, T-5-N, T&P Sur. IPF 152 BOPD, plus 65.4% water, 15/64-in. choke, 36.4°, GOR 39:1, TP 200 psi. Ellenburger 8,481-87 ft. TD 8,505 ft. New oil discovery.

Gaines County:

Monsanto Chemical Co. 1 Birge, 16 miles east of Seminole in Lab. 15, Lge. 294, Lynn CSL Sur. IPF 120 BOPD, 14/64-in. choke, 34.8°, GOR 28:1, TP 125 psi., packer, Devonian 12,781-85 ft. TD 12,823 ft. PBTD 12,821 ft. New oil discovery.

UTAH

San Juan County:

Texaco Inc. 1 Navajo "U," NCT, NE NE 32-40s-26e. IPP 14 BOPD, 17 BSW, 40.3°, Ismay 5,420-60 ft. TD 5,726 ft. Ismay discovery, new field.

WYOMING

Crook County:

U. S. Smelting, Refining, and Mining Co. 1-32 Kummberfield, C NW NE 32-51n-68w. IPF 5,200 M.c.f.d., Dakota 6,093-96 ft. TD 6,125 ft. Dakota discovery, new field.

Big Horn County, Cherry anticline:

C. A. Blake et al. 1 Government, SE NE NW 13-52n-92w. IPP 2½ BOPD, Phosphoria 1,276-90 ft. TD 1,296 ft. Phosphoria discovery, new field.

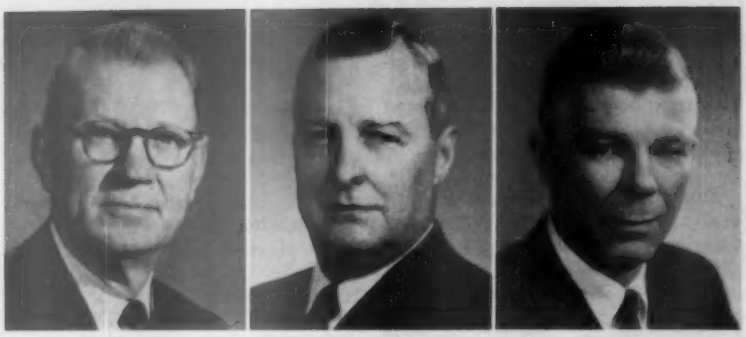
Freemont County, Pavillion:

Shell Oil Co. 14-12 Unit, SW SW 12-3n-2e. IPF 1,945 M.c.f.d., 24/64-in. choke, Fort Union 3,838-58 ft. TD 6,505 ft. Fort Union discovery, new field.

September well completions in the U. S.

State—	Total completions											Wildcats							
	Total	Oil	Cond.	Gas	Dry	Service	Footage	Cum. wells 1960	Cum. footage 1960	Cable-tool comp.	D.D.	Total	Oil	Cond.	Gas	Dry	Footage	Cum. wells 1960	Cum. footage 1960
Alabama	1	1	0	0	0	0	11,332	33	345,044	0	0	0	0	0	0	0	0	2	3,517
Alaska	2	0	0	1	1	0	23,053	12	133,574	0	0	2	0	0	1	1	23,053	5	61,082
Arizona	2	0	0	0	2	0	2,114	26	55,769	0	0	0	0	0	0	0	0	18	38,335
Arkansas	43	18	1	4	19	1	163,442	445	1,627,032	0	0	9	2	0	1	6	37,569	120	470,304
California	119	77	0	12	30	0	498,848	1,206	5,565,285	0	19	22	1	0	1	20	114,194	234	1,299,767
Colorado	53	8	0	10	35	0	280,065	476	2,339,697	0	0	25	1	0	1	23	128,860	240	1,180,730
Florida	0	0	0	0	0	0	0	4	46,332	0	0	0	0	0	0	0	0	4	46,332
Illinois	203	70	0	2	75	56	419,819	1,706	3,440,797	*29	11	50	7	0	0	43	105,760	358	668,526
Indiana	103	37	0	0	66	0	136,435	783	1,065,675	*81	5	32	0	0	0	32	30,124	285	352,852
Iowa	1	0	0	0	1	0	770	4	4,277	1	0	1	0	0	0	1	770	4	4,277
Kansas	547	277	0	18	219	33	1,102,613	2,899	9,032,931	287	0	91	15	0	12	64	336,910	787	2,910,193
Kentucky	237	19	0	21	51	146	300,910	1,550	2,085,497	*191	0	17	2	0	1	14	31,692	135	205,983
Louisiana	277	126	29	22	98	2	2,113,170	2,659	21,183,007	0	0	34	1	3	0	30	280,953	410	3,536,974
North	110	48	0	16	45	1	414,298	999	3,856,670	0	0	16	1	0	0	15	87,010	195	1,001,740
South	129	58	20	6	44	1	1,294,528	1,286	13,302,357	0	0	16	0	1	0	15	167,405	190	2,209,586
Offshore	38	20	9	0	9	0	404,344	374	4,023,980	0	0	2	0	2	0	0	26,538	25	325,648
Michigan	101	27	0	1	40	33	316,985	680	2,280,394	37	0	29	0	0	0	29	106,812	180	664,250
Mississippi	48	21	0	1	26	0	454,054	515	5,158,411	0	0	19	2	0	0	17	156,087	197	1,910,596
Missouri	1	0	0	0	1	0	2,990	27	44,639	1	0	1	0	0	0	1	2,990	27	44,639
Montana	35	12	0	1	22	0	163,111	237	1,142,993	2	1	15	0	0	1	14	60,425	111	470,039
Nebraska	55	17	0	0	38	0	291,953	650	3,606,550	0	1	24	3	0	0	21	127,682	266	1,429,546
Nevada	1	0	0	0	1	0	3,860	3	11,762	0	0	1	0	0	0	1	3,860	3	11,762
New Mexico	161	80	2	38	40	1	790,344	1,405	6,897,968	33	5	20	5	0	0	15	94,269	211	1,079,222
West	76	23	1	35	16	1	338,159	489	2,232,498	8	4	12	3	0	0	9	36,679	58	213,595
East	85	57	1	3	24	0	452,185	916	4,665,470	25	1	8	2	0	0	6	57,590	153	865,627
New York	26	8	0	6	5	7	47,678	237	415,503	26	0	5	0	0	3	2	15,978	39	137,400
North Carolina	0	0	0	0	0	0	0	3	4,896	0	0	0	0	0	0	0	0	3	4,896
North Dakota	24	13	0	0	11	0	163,587	225	1,435,066	0	2	7	1	0	0	6	55,297	60	348,941
Ohio	115	46	0	20	26	23	305,783	790	1,946,988	110	0	3	0	0	0	3	10,341	38	133,958
Oklahoma	350	167	6	29	112	36	1,195,071	3,454	13,165,577	98	0	52	9	1	8	34	247,060	553	2,821,054
Oregon	0	0	0	0	0	0	0	7	16,685	0	0	0	0	0	0	0	0	7	16,685
Pennsylvania	152	49	0	44	15	44	444,568	670	1,880,938	150	0	5	0	0	2	3	28,963	15	91,568
South Dakota	1	0	0	0	1	0	3,610	18	122,754	0	0	1	0	0	0	1	3,610	7	28,458
Tennessee	17	1	0	1	15	0	16,582	66	54,580	17	0	17	1	0	1	15	16,582	62	53,361
Texas	1,091	513	68	69	411	30	4,567,226	11,769	50,459,983	55	21	206	19	2	4	181	939,476	2,419	10,991,231
District 1	75	31	1	4	38	1	201,243	815	2,224,508	5	0	26	1	0	2	23	70,762	304	917,655
District 2	53	13	10	12	18	0	346,157	574	3,796,123	0	1	9	1	1	0	7	69,048	142	997,135
District 3	67	19	6	6	36	0	497,113	890	6,214,323	0	0	15	1	0	0	14	138,055	167	1,503,436
District 4	75	14	9	14	36	2	425,807	811	4,486,987	0	1	19	1	0	1	17	107,490	229	1,290,572
East (5 & 6)	97	47	13	0	36	1	458,062	960	4,490,437	0	0	20	1	1	0	18	101,493	198	1,104,255
District 7-B	168	79	6	7	74	2	453,275	1,719	4,824,757	0	6	38	6	0	1	31	118,295	487	1,451,136
West (7-C & 8)	271	177	11	5	60	18	1,368,375	3,068	15,424,309	13	11	38	5	0	0	33	187,660	475	2,167,637
District 9	223	109	4	0	104	6	581,584	2,167	5,501,451	37	0	40	3	0	0	37	143,523	373	1,209,027
District 10	62	24	8	21	9	0	235,610	765	3,497,088	0	2	1	0	0	0	1	3,150	44	350,378
Utah	8	2	0	0	6	0	56,743	176	996,296	0	0	5	0	0	0	5	36,213	62	355,860
Washington	0	0	0	0	0	0	0	2	9,740	0	0	0	0	0	0	0	0	2	9,740
West Virginia	69	9	0	56	3	1	167,512	612	1,519,214	67	0	0	0	0	0	0	0	6	46,063
Wyoming	71	29	1	5	36	0	347,778	776	3,872,699	4	3	31	1	1	1	28	169,962	317	1,717,280
Total September 1960	**3,914**	**1,627**	**107**	**361**	**1,406**	**413**	**14,392,006**	**34,125**	**141,968,553**	**1,189**	**68**	**724**	**70**	**7**	**37**	**610**	**3,165,492**	**7,187**	**33,145,421**
Total August 1960	4,714	1,981	127	387	1,713	506	18,679,234	.....	.....	929	54	914	76	9	29	800	4,312,854	.....	.....
Cumulative 1960	**34,125**	**15,364**	**992**	**2,811**	**13,012**	**1,946**	**141,968,553**	.....	.....	**6,565**	**454**	**7,187**	**633**	**78**	**250**	**6,226**	**33,145,421**	.....	.....
Cumulative 1959	37,820	18,824	927	2,789	14,256	1,024	157,467,475	.....	.....	.....	.....	7,391	674	91	237	6,389	36,043,236	.....	.....

*Estimated.



RHOADES WHITEFORD BROCKETT

Gulf Oil Shuffles Its Top Command

GULF OIL CORP. shuffled its top command last week.

President W. K. Whiteford, 60, moved into the board chairmanship but will continue as chief executive officer of the company.

E. D. Brockett, 47, executive vice president, stepped into Whiteford's post as president.

Ralph O. Rhoades, who has reached retirement age, resigned from the board chairmanship but will remain a member of the board.

The changes occurred at a meeting of Gulf's board of directors at Pittsburgh and are effective October 31.

Brockett's election gives Gulf its second youngest president, only W. L. Mellon, a company founder, was younger when he became president at 41.

Brockett joined Gulf in 1934 upon graduation from Texas A & M. He held executive positions in the Fort Worth, Pittsburgh, and Caracas offices before being elected a vice president in charge of the Houston production division in 1955.

He went to Pittsburgh as production coordinator in 1957 and the following year left Gulf to become president of British American Oil Co. He returned to Gulf last January 1 as executive vice president, director, and executive committee member.

Whiteford a veteran . . . Whiteford had a long executive career with Barnsdall Oil Co. and British American before joining Gulf 9 years ago as executive vice president. He had been Barnsdall's vice president and general manager of the Mid-Continent division and later president and board chairman of British American.

After serving 18 months as executive vice president of Gulf, he became president in April 1953 and in 1954 received the additional title of chief executive officer.

Rhoades had a long career as a world-traveling geologist and was one of the early investigators of oil prospects in Kuwait. He became a Gulf vice president in 1951, board member in 1957, executive vice president in 1958, and board chairman in 1959.

Rhoades resigned as executive committee vice chairman. Brockett becomes vice chairman. Gulf did not announce plans to replace Brockett as executive vice president.

Raymond J. Hafsten, assistant chief engineer the past 6 years, has been promoted to chief engineer in charge of the refinery engineering division, Standard Oil Co. (Ind.) in Whiting. He succeeds **Philip L. Krauel,** retiring after 42 years' service. Before joining Standard in 1946, Hafsten held research and engineering posts with Armour Research Foundation.

HAFSTEN

Thomas D. Cabot, Jr., has been elected president of Texas Butadiene & Chemical International, Ltd. TBCI is a Canadian subsidiary of Texas Butadiene & Chemical Corp. and is engaged in overseas sales of butadiene and synthetic rubber. The company will open a branch office November 15 in Lausanne, Switzerland, in charge of **James F. O'Haren,** European commercial manager. **Dr. C. Wheaton Vaughan,** recently appointed assistant director of the TBCI development department, will handle the company's technical and development activities in Europe.

C. D. Owens, Jr., is new director of personnel for Sinclair Oil Corp. and its subsidiaries. Owens joined Sinclair in 1949 at Tulsa, became manager of industrial relations for Sinclair's producing subsidiary in 1957 and since 1959 has been in Sinclair's industrial relations department in New York.

▶▶▶ Personals

Roland S. Bond, Dallas, has been named chairman of the board, and **William V. Byrd,** Corpus Christi, president, of Palm Petroleum Corp., Corpus Christi, newly formed by former owners of Renwar Oil Corp. **D. W. Forbes,** Dallas, is vice president; **H. N. Lyle,** vice president in charge of operations; **Earl K. Wilson,** Dallas, vice president and controller; **H. W. Campbell,** secretary and land manager, and **M. H. Davis,** treasurer. **Burlin E. Freeze** is chief engineer, **Travis E. Hicks,** chief geologist, **Frank A. Straus,** Dallas, assistant secretary - treasurer, and **James M. Easterling,** general counsel. Directors are **Guy I. Warren,** Bond, Forbes, Byrd, and Wilson.

Leonard McCampbell, D-X Sunray Oil Co., is president of the newly formed Oil Men's Club of Tulsa, an organization of 43 marketing representatives. **Charles Paul,** Phillips Petroleum Co., is vice president; **R. W. Willhour,** Countryman Oil Co., secretary, and **R. D. Phillips,** Petroleum Marketing Co., treasurer.

Newby C. Simpson, administrative vice president of Gulf Oil Corp., has been named manager of Gulf's production operations in Libya. Simpson has been administrative vice president in Houston since 1959. He also has been U. S. production coordinator and a division production manager for Gulf.

Norman C. Sidebotham has been promoted to manager, overseas manufacturing and technical liaison, in Chemstrand Corp.'s overseas division, effective November 1. He will continue to headquarter in Decatur, Ala., site of Chemstrand's acrylic fiber plant.

W. A. Keleher, Albuquerque historian and general counsel for Pubco Petroleum Corp., has been appointed a director of Pubco to fill the unexpired term of Ralph J. Wann, who died recently at his Canon City, Colo., home.

C. M. Lydy, job engineer with Mobil Oil Co. at Torrance, Calif., has been transferred to New York as senior engineer with Socony Mobil Oil Co., Inc.

William J. Geary has been named geologist with Peak Petroleum Co., of Denver.

Personals

Leonard L. Aitken, Denver, was elected president of the Rocky Mountain Oil and Gas Association at the fifteenth annual convention in Denver. He succeeds **Frank H. Gower,** Denver. Other officers are: **Samuel Butler, Jr.,** Englewood, vice president for Colorado; **Warren A. Morton,** Casper, reelected Wyoming vice president; **Ralph W. Gemmer,** Billings, reelected Montana vice president; **Grant A. Brown,** Salt Lake City, vice president for Utah; **James L. Parmelee,** Omaha, reelected Nebraska vice president; and **Walter W. Wittlinger,** Casper, reelected treasurer.

H. K. Arnold and **M. Rosenbaum** have been promoted to senior chemical engineers in the technical division of Humble Oil & Refining Co.'s Baytown, Tex., refinery. Arnold will supervise improved process operations and electronic computing, and Rosenbaum will direct long-range planning projects involving fuels and manufacture of specialties.

E. B. Claunch, formerly chief geophysicist for Cities Service Petroleum Corp. at Bogota, Colombia, has been transferred to San Antonio as division geophysicist for Arkansas Fuel Oil Corp.

Cameron L. Cox, production superintendent for Sinclair Oil & Gas Co. at Jackson, Miss., has been transferred to Lafayette, La., as production superintendent.

Ray West, petroleum engineer with Pure Oil Co. at Van, Tex., has been transferred to Dollarhide, Tex., as petroleum engineer.

KUNKEL

Turner L. Kunkel has been made manager of the Los Angeles producing division of Texaco Inc. He succeeds **J. Harold Puls,** who retires January 1 after 35 years service. Kunkel, with Texaco 26 years, has been chief geophysicist in the exploration division at Houston. He will be succeeded there by **Dosh T. McCreary,** formerly assistant chief geophysicist.

George W. Butler, coordinator of world-wide marketing activities for Standard Oil Co. (N. J.) has been elected a director of Esso Research & Engineering Co.

Seymour Meyerson and **John B. Peri** have been named senior research scientists with Standard Oil Co. (Indiana) laboratories at Whiting, Ind. **Robert A. Mosher** has been appointed senior project chemist at the company's Whiting laboratories.

Sam H. Casey, executive vice president of Commonwealth Oil Refining Co., Inc., of Ponce, Puerto Rico, has been elected president and chief executive officer of Commonwealth. He

CASEY

DIWOKY

succeeds **Roy J. Diwoky,** president, who was elevated to the new post of chairman of the board of directors. Commonwealth operates a refinery at Guayanilla Bay, near Ponce.

John McVean Luard, general manager of exploration in the British Petroleum group's headquarters office, London, has been elected a director of BP Exploration Co., Ltd. **John Moffat,** general manager for refining in the London home office, has been elected a director of BP Refinery (Llandarcy), Ltd., BP Refinery (Kent), Ltd., and BP Refinery (Grangemouth), Ltd.

J. S. Stoffer has assumed duties as financial coordinator of Gulf Oil Corp.'s domestic production operations. He succeeds **K. E. Rotegard,** recently appointed manager of the domestic services department. Stoffer goes to Houston for his new assignment from Abadan, Iran, where he has been on loan from Gulf as chief accountant of Iranian Oil Refining Co. He joined Gulf in 1934 in Tulsa and before going to Iran in 1958 was financial and services manager for Gulf's Denver production division.

Dr. Howard J. Philipp has been named to a new position of vice president, planning, of Celanese Fibers Co., Charlotte, N. C. A native of Austria, he received his doctors degree in physical chemistry at the University of Vienna in 1935. He joined Celanese in 1945.

C. H. Calvert, Jr., drilling consultant, has joined the gas reserves and availability division of Northern Natural Gas Co., Omaha, as a reserves engineer.

M. E. Pickett, Jr., is newly appointed vice president of Columbian Carbon (Canada), Ltd., and general manager of its carbon-black and pigment division. Since 1957 he has been supervisor of channel-black quality control at production headquarters of the parent company, Columbian Carbon Co., in Monroe, La. The company has under construction a carbon-black plant at Hamilton, Ont. Pickett will move to Canada soon.

Edward C. Mitchell has been named assistant to the vice president, foreign operations department (Eastern Hemisphere) of Texaco Inc. He has served as assistant general sales manager for Texaco's central region in Chicago since January, after service in Africa and Latin America.

Sadao Yorozu, operations department manager of Maruzen Oil Co., has been made director of the newly established Maruzen-Toyo Co. and will head its Singapore office.

George L. Scott has been named manager of employe relations and organization planning for Gulf European Co., London. He had been coordinator of organization planning for Gulf Oil Corp.

W. Dawson Wallace will become assistant manager of Pure Oil Co.'s general tax department, Chicago, effective November 1. He has been with Pure since 1950.

Masao Kawazoe, director of General Bussan K.K., has been named a director of General Oil Co.

Richard J. Cotter has been elected a vice president of Sinclair Refining Co. He is general sales manager of Sinclair's eastern marketing region, covering 14 states, and offices in New York City.

Harold D. Brennand, has been named vice president and general manager of The California Co., in charge of sales. Since 1956 he has been manager of crude oil, natural gas, and plant-product sales. A geologist, Brennand has seen service in the company's exploration, land, finance, and sales departments. He is a charter member and past president of the New Orleans Petroleum Club, a director of the Independent Natural Gas Association and chairman of the INGA's producers' committee.

J. Ronald Getty, with Tidewater Oil Co. since 1953 as European sales representative, marketing manager, and a director, has been appointed president and general manager of Veedol International. This new company will direct expanding operations of Tidewater's European manufacturing and marketing subsidiaries with exception of Dansk Veedol, a Danish-based subsidiary, which Getty will serve in an advisory capacity. Central offices for Veedol International, which also will handle Tidewater's export operations in Europe, Africa, and the Middle East, will be established in Switzerland.

E. Herbert Herlihy, Los Angeles, has been elected a director of Southern California Petroleum Corp. He is senior member of the law firm of Herlihy & Herlihy, and president of A-Lee Investment Co., Inc.

Charles R. Pirtle, has been promoted to district landman in Denver for Lion Oil Co., a division of Monsanto Chemical Co. Pirtle has been with Lion since 1954, serving in Corpus Christi, Houston, and Shreveport.

Marnell A. Segura has been named research associate in the chemicals division of Esso Research & Engineering Co. Segura, with Esso since 1942, holds 21 patents. He will head a project concerned with end-use research on construction materials.

W. T. Hudson, consulting geologist specializing in petroleum and helium, has opened offices in Phoenix, Ariz. He formerly did consulting work in Denver.

Dr. Eric Rau, Dr. John F. Jones, Jr., and **Charles B. Hopkins, Jr.,** have been named to the central research department of Food Machinery & Chemical Corp.'s chemical research and development center, Princeton, N. J. Dr. Rau has been associated with Westinghouse Electric Corp. as senior engineer, Dr. Jones formerly was Esso Research & Engineering Co. process engineer, and Hopkins was senior research engineer with Cities Service Research & Development Co.

C. J. van der Werff has been named administrative assistant to the director of exploration and production in Caracas for Shell de Venezuela. He replaces **E. A. Moore,** who has been transferred to Canada.

Curtis J. Gilmore, with Pan American Petroleum Corp. at Denver, has been transferred to the production engineering department at Midwest, Wyo.

Zenichiro Sakamaki, president of Nippon Petrochemical Co., has become president of Nippon Oil Detergent Co., Ltd., a new company established by Nippon Petrochemical. Others named directors of the new firm are **Shigeru Hayashi, Ryoji Negishi, Noboru Aoki,** and **Shoji Miwa.**

William A. Power, formerly field engineer with Texaco Inc. at Pierce, Tex., has been transferred to Liberty, Tex., as petroleum engineer in the reservoir engineering department.

John J. Cullen has been named general superintendent of the Perth Amboy refinery of The California Co. effective November 1. **John E. Walkey** has been appointed manager of engineering and technical services.

WALKEY

CULLEN

In other changes, **G. H. Jefferis** was named superintendent of manufacturing and utilities, **W. C. Neilsen** assistant manager of engineering and technical services and chief engineer, and **Minor L. Fahrmann** was named to a new post of manager of maintenance and construction.

F. L. Mackey, formerly Humble Oil & Refining Co. district geologist at Liberal, Kans., has been transferred to Oklahoma City as Carter division district geologist.

Richard B. Kirk has been assigned to assist in startup of new processing units at Standard-Vacuum Oil Co.'s Altona, Australia, refinery. He will help train permanent crew members for the units. Kirk is on loan from his post as assistant process operator at Mobil's Beaumont, Tex., refinery.

Lawrence W. Chasteen, valuation engineer for Union Oil Co. of California, has been awarded a Certificate of Service by the Society of Petroleum Engineers. It was presented for Chasteen's work on the AIME volume "Statistics of Oil and Gas Development and Production."

▶▶▶ Personals

Four men have been named to top positions in the Houston marketing division of Gulf Oil Corp. **R. B. Gillies,** a 34-year Gulf veteran, was named division sales coordinator.

J. L. Neveux, operations superintendent, was advanced to superintendent of supply and field services. **A. L. Carter** was promoted from merchandising supervisor to supervisor of dealer and sales training. **C. O. Reynolds,** on special assignment in Pittsburgh the past year, was appointed office services supervisor.

Robert W. Ross has been appointed superintendent of the natural-gas-liquids section of Cities Service Oil Co.'s supply and distribution division. He has been with Cities Service in supply and sales capacities since 1949.

E. David Philley has been appointed manager of property acquisitions for Pure Oil Co. He formerly was general counsel and land department head for Woodley Petroleum Co. He will become a member of the Chicago general office exploration and production staff but will continue to live in Houston. **George C. Morris,** who for the past 15 months has directed property acquisitions, will continue in this field as consultant. He has been with Pure 38 years.

E. D. Reinerio, formerly a computer with Atlantic Refining Co. at Dallas, has accepted a faculty post at the University of Wisconsin, Madison, as a research geologist-geophysicist.

J. S. Royds, administrative vice president and general exploration manager for Continental Oil Co., has been made vice president and exploration manager for the company's foreign exploration and production department, a new post. Royds formerly was exploration manager of Sahara Petroleum Co., an affiliate, in Egypt.

Alton B. McClung has been appointed assistant chief geophysicist for Texaco Inc. effective November 1 and will be transferred from Denver to Houston. **Francis A. Seamans,** assistant division geophysicist at Denver for Texaco, has been made division geophysicist.

Personals

Thomas W. Moore, a vice president of Esso Standard division of Humble Oil & Refining Co., New York, has been made vice president for supply and transportation, effective November 1. He will headquarter in Houston. Moore joined Esso in 1934 as an engineer at its Bayway, N. J., refinery. He became assistant manager of the coordination and petroleum economics department of Standard Oil Co. (N. J.) in 1954, and returned to Esso in 1959.

Dr. J. F. Johnson and **Dr. R. L. LeTourneau,** both group supervisors, have been promoted to supervising research chemists in the analytical and physical measurements section of California Research Corp.'s Richmond laboratory.

C. Robert Geiser, product manager of Pennsalt Chemicals Corp.'s industrial-chemicals division, has been promoted to manager of product development. **Robert O. Rowe** will succeed Geiser.

Ralph P. Smith has been named manager of Sun Oil Co.'s Hamtramck, Mich., sales district. He succeeds the late Douglas H. Carnegie. **Charles P. Cooley** will succeed Smith as manager of the Youngstown, Ohio, sales district.

Bernard J. Heiart, Jr., budget administrator and secretary of the headquarters operations committee for Humble Oil & Refining Co., Esso Standard division, retired October 1. He had served as aide to seven of Esso Standard's eight presidents during his 44 years' service.

Robert P. Kunkel has opened an office as independent consulting geologist in the State Exchange Building, Salt Lake City. He formerly was geologist with Fehr & Lyon, Salt Lake City.

Dr. K. A. Smith is manager and **A. J. Piermonte** is coordinator of data processing of a new electronics department formed by Sinclair Oil Corp. to coordinate processing and computing activities in its operating subsidiaries. Dr. Smith has served in research and managerial positions at the Sinclair Research Laboratories, Inc., Harvey, Ill., and Piermonte has been data processing coordinator in the comptroller's department.

Gilbert M. Ellis has been named manager of LPG sales for the branded marketing division of Ashland Oil & Refining Co. He will direct sales in Kentucky, Ohio, West Virginia, and New York. **William R. Walls,** formerly an Ashland sales representative, has been appointed LPG merchandising manager. Ellis joined Ashland in 1941. Walls, an employe since 1955, has been district supervisor at Glasgow, Ky.

L. S. Marshman, manager of wholesale planning in the Mobil Oil Co. marketing department, New York, will become manager of the crude oil and gas liquids department of Mobil in Los Angeles November 1. **Arnold D. Bennison,** now head of the liquids department, is retiring after 41 years service.

Phillip H. Seeley has opened his own office for land check and title search service in Bakersfield, Calif. He formerly was employed by Shell Oil Co. and Union Oil Co. of California in engineering and geological drafting.

Randall Graber, geologist with Phillips Petroleum Co., has been transferred to Houston from Lafayette, La.

Frank V. Williams has been named refinery manager at Durban, South Africa, for Standard-Vacuum Refining Co. of South Africa (Pty.), Ltd. He transferred from White Plains, N. Y., where he has served as a member of Stanvac's international headquarters staff for 5 years. He has been manager of the company's lubricating and special products supply department since 1938.

Charles F. Barnard has been named manager of the pipeline division of Tears Engineers, Dallas. He formerly was president of Barnard & Ancira, Inc. The pipeline division will handle construction operations for the refining, chemical, and petrochemical industries.

Deaths

Jean Serratrice, secretary general and financial manager of the RAP, CREPS, SOGERAP and TRAPSA group, died suddenly while on vacation in Switzerland on September 21. He was one of the founders of BRP and a close assistant of Paul Moch, whose role in the promotion of research is well known both in France and the Sahara. Serratrice was 60.

Charles Lee Saultz, 69, who retired in 1948 from Service Pipe Line Co., died October 13 in Tulsa. He moved to Tulsa from Topeka in 1950.

Mervin G. Hansbro, Houston, attorney and independent oil operator, died October 19 in Panola County, Texas, while inspecting oil holdings. He was a native of Humble and practiced law in Houston before entering the oil business.

Gillette Hill, 65, Houston independent oil operator, died October 19 in a Houston hospital following a brief illness. He had lived in Houston 27 years. In addition to extensive oil activities, he was widely known as founder of Ducks Unlimited, an international organization for preservation of ducks and geese.

J. O. Willett, 52, founder of J. O. Willett Pipe Line Stringing Corp. of Monroe, La., died October 15 following a long illness.

Robert Lee Briggs, 91, lease and title man and claim agent for Deep Rock Oil Corp. and its predecessors from 1916 to 1948, died October 22 at his ranch home in Mannford, Okla. He entered the oil business in 1911, doing lease and title work for the T. B. Slick interests.

LaVerne C. Berger, 54, Muskegon, Mich., a vice president for crude procurement for Naph-Sol Refining Co., died October 13 of a heart attack. A native of Cedar Rapids, Iowa, he had been with Naph-Sol since 1937.

Harry J. Culbertson, 84, died October 24 at his home in Wichita Falls, Tex. He actively engaged in drilling and producing operations in Tulsa from 1910 to 1925. He had lived in Wichita Falls 18 years.

David Earl Willis, 66, a member of Petroleum Production Pioneers, died October 16 in a Bakersfield, Calif., hospital. He had worked in the oil industry 26 years and had been drilling supervisor for Richfield Oil Co.

Clinton E. Comstock, 60, division supervisor of communications for Pacific Gas & Electric Co., Fresno, Calif., died October 18 of a heart attack while traveling from Bakersfield to Fresno. He has been with PG&E since 1918.

California imports more natural gas than any other state

Illinois is a prime market for out-of-state gas, but California has topped it each year since 1954.

BY JOHN C. CASPER

LINES represent shipments of gas to California and Illinois from other states during the postwar period.

INCREASED consumption of natural gas in California has been based on a rapid rise in receipts from other states. All of this gain in imports has been in the postwar period.

According to reports by the Bureau of Mines, California received its first out-of-state gas in 1947. Shipments that year were from New Mexico and amounted to 3.4 billion cubic feet. Total shipments climbed to 65 billion in 1948. These receipts were small in comparison with production in California.

California's marketed production of gas amounted to 555 billion cubic feet in 1947. The New Mexico gas supplied only 0.6% of total gas in the state for 1947 and 1.03% for 1948.

California gas production reached a peak in 1948 when operators produced and sold 571 billion cubic feet. There has been a gradual decline since that year. Marketed production was down to 466 billion in 1958 but rose slightly to 486 billion in 1959.

California with its booming population and dwindling gas production became a prize market for out-of-state gas in the postwar period.

Gas imports for the state exceeded local production for the first time in 1956. Imports were up to 551 billion cubic feet and domestic production dropped off to 504 billion.

Latest figures for 1959 show imports at 730 billion and local production down to 504 billion. Imports for the year topped production by 50%.

California Holds Customer Lead

California has more residential customers than any other state, but it is not the top state in volume of residential sales. Last year, Ohio had about half as many residential customers but sold them 15% more gas.

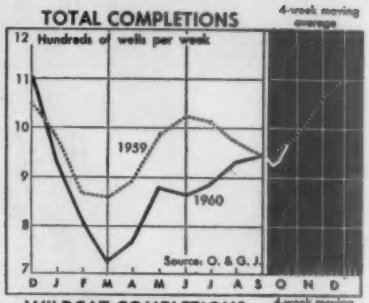
California's increasing supply of out-of-state gas has resulted in greater gains in sales to industrial accounts than to residential and commercial customers. For the 1946-59 period residential and commercial sales gained 214.2 billion cubic feet or 115.8%. Industrial sales jumped 478.3 billion or 158%.

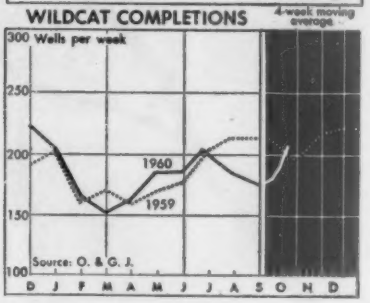
The increasing percentage of sales going to industrial accounts runs counter to the trend for the country as a whole. Industrial customers bought 77.5% of all gas sold in 1946 but had dropped off to 67.1% of the total last year.

California ranks fifth as a gas-producing state. It is the only state out of the top five with industrial sales larger than production. California's industrial sales last year were 30% above marketed production. Industrial sales in Texas were only 46% of marketed production. The ratio was 30% in Louisiana, 33% in New Mexico, and 44% in Kansas.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,833,120	DOWN	2,755	DOWN	93,776
Crude stocks	231,553,000	UP	1,565,000	DOWN	20,259,000
Completions	1,091	UP	123	UP	38
Refinery runs	7,947,000	UP	49,000	UP	285,000
Gasoline stocks	187,002,000	DOWN	1,157,000	UP	8,985,000
Kerosine stocks	36,807,000	UP	820,000	UP	3,631,000
Distillate stocks	177,632,000	UP	2,566,000	DOWN	3,813,000
Residual stocks	50,929,000	DOWN	498,000	DOWN	7,770,000
Four-product stocks	452,370,000	UP	1,731,000	UP	1,033,000
Total imports	1,796,200	UP	187,600	UP	218,600





Active Rotary Rigs

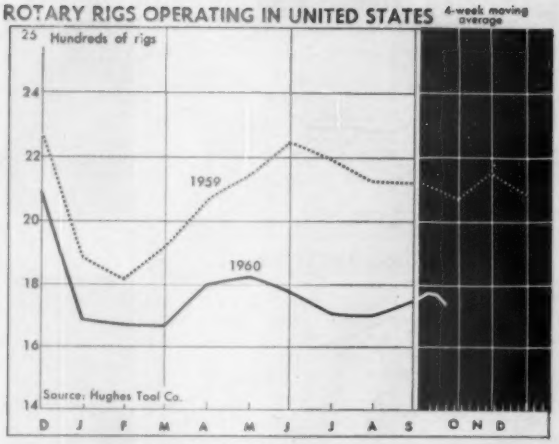
	10-24-60	10-17-60	10-26-59
Alabama	2	2	6
Alaska	7	7	(†)
Arkansas	12	13	12
Arizona	2	2	1
California	72	71	98
Land	69	68	92
Offshore	3	3	6
Colorado	56	58	48
Florida	3	3	3
Land	2	2	2
Offshore	1	1	1
Georgia	1	1	0
Illinois	50	52	40
Indiana	9	8	10
Iowa	1	1	0
Kansas	104	113	154
Kentucky	5	5	10
Louisiana	278	262	326
North	37	26	44
S. Inland waters	95	98	108
S. Land	73	81	118
Offshore	73	57	56
Maryland	0	0	0
Michigan	28	31	37
Mississippi	61	60	73
Missouri	1	1	0
Montana	23	19	22
Nebraska	25	25	22
Nevada	0	0	1
New Mexico	88	105	121
New York	2	2	0
North Dakota	16	17	21
Ohio	5	4	5
Oklahoma	157	170	218
Oregon	1	1	0
Pennsylvania	10	8	14
South Dakota	0	0	8
Texas	572	594	720
S. Inland waters	9	5	2
S. Land	156	163	183
Offshore	1	1	5
North	43	42	182
Panhandle	44	44	(*)
East	56	59	(*)
West Central	151	168	208
West	112	112	140
Utah	26	27	28
Washington	1	1	2
West Virginia	6	6	5
Wyoming	68	68	91
Total U. S.	1,692	1,737	2,096
Western Canada	149	157	174
Eastern Canada	1	1	1
Grand total	1,842	1,895	2,271

Hughes Tool Co. report. *Included in North. Comparisons not available due to change in method of reporting. †Data first reported 4-4-60.

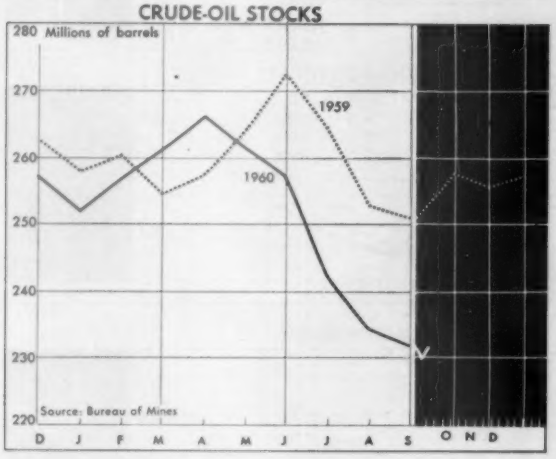
WEEKLY WELL COMPLETIONS... WEEK ENDED OCTOBER 22, 1960

	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1960	1959	Total	Crude	Cond.	Gas	Dry	1960	1959
Alabama	0	0	0	0	0	0	0	36	78	0	0	0	0	0	2	20
Arizona	1	0	0	0	1	0	5,799	29	23	1	0	0	0	1	19	21
Arkansas	10	7	0	2	1	0	39,253	481	684	0	0	0	0	0	126	121
California	44	29	1	1	13	0	181,861	1,339	1,244	3	0	0	0	3	247	326
Colorado	11	3	1	2	5	0	44,665	510	619	6	0	1	0	5	261	362
Illinois	44	15	0	0	16	13	80,310	1,839	1,838	11	4	0	0	7	391	310
Indiana	22	3	0	0	19	0	28,448	855	692	10	1	0	0	9	314	237
Kansas	78	37	0	7	27	7	214,678	3,189	3,236	17	2	0	1	14	852	845
Kentucky	23	7	0	0	16	0	33,071	1,679	2,106	2	2	0	0	0	158	258
Louisiana	91	41	9	5	36	0	657,431	2,901	3,057	20	1	2	1	16	452	420
North	33	9	0	5	19	0	107,819	1,097	1,196	7	0	0	1	6	217	189
South	46	25	8	0	13	0	421,045	1,403	1,532	12	1	2	0	9	208	216
Offshore	12	7	1	0	4	0	128,567	401	329	1	0	0	0	1	27	15
Michigan	22	9	0	0	12	1	89,421	762	523	8	1	0	0	7	205	140
Mississippi	17	8	3	0	6	0	173,633	554	516	5	2	0	0	3	212	228
Montana	8	4	0	0	4	0	44,159	266	266	3	0	0	0	3	125	88
Nebraska	18	3	0	0	15	0	93,401	710	730	12	0	0	0	12	302	313
New Mexico	32	16	0	6	9	1	168,481	1,522	1,685	4	0	0	0	4	216	198
West	12	4	0	5	2	1	63,724	545	757	1	0	0	0	1	60	53
East	20	12	0	1	7	0	104,757	977	928	3	0	0	0	3	156	145
New York	0	0	0	0	0	0	0	258	217	0	0	0	0	0	38	19
North Dakota	5	3	0	0	2	0	39,557	242	367	2	0	0	0	2	66	67
Ohio	29	12	0	8	5	4	78,355	869	844	0	0	0	0	0	40	24
Oklahoma	175	86	1	11	25	52	423,235	3,747	4,542	10	4	0	0	6	583	696
Pennsylvania	73	25	0	15	6	27	170,905	592	441	3	0	0	0	3	13	10
South Dakota	0	0	0	0	0	0	0	19	15	0	0	0	0	0	8	7
Texas	345	160	17	21	142	5	1,317,329	12,737	15,333	76	5	0	1	70	2,627	2,889
Dist. 1	32	18	0	1	13	0	78,701	903	879	8	0	0	0	8	332	267
Dist. 2	19	3	2	6	8	0	115,924	622	645	3	1	0	0	2	153	189
Dist. 3	24	7	4	1	12	0	180,763	965	979	4	0	0	0	4	181	195
Dist. 4	21	7	2	1	9	2	116,714	876	1,089	5	0	0	0	5	243	266
East	29	12	3	0	13	1	143,308	1,037	1,035	8	0	0	0	8	215	198
Dist. 7-B	53	35	0	0	17	1	140,259	1,835	2,115	9	1	0	0	8	516	570
West	61	35	6	2	17	1	262,658	3,266	4,630	12	2	0	1	9	507	635
Dist. 9	79	27	0	2	50	0	169,711	2,385	2,896	26	1	0	0	25	432	480
Dist. 10	27	16	0	8	3	0	109,291	848	1,065	1	0	0	0	1	48	89
Utah	5	2	0	0	3	0	24,169	189	246	3	0	0	0	3	71	67
West Virginia	0	0	0	0	0	0	0	652	634	0	0	0	0	0	7	27
Wyoming	37	13	0	1	23	0	136,157	852	774	20	0	0	1	19	349	272
Misc. (Mo.)	1	0	0	0	1	0	2,990	117	80	1	0	0	0	1	107	53
Total U. S.	1,091	483	32	79	387	110	4,047,308	36,946	40,790	217	22	3	4	188	7,791	8,018
Previous week	968	423	31	78	393	43	3,785,935	.....	.....	222	20	2	5	195	.....	.....
Cum. 1960	36,946	16,682	1,076	3,042	14,085	2,061	153,453,658	.....	.....	7,791	697	84	264	6,746	.....	.....
Cum. 1959	40,790	20,237	997	3,034	15,387	1,135	169,177,748	.....	.....	8,018	727	94	261	6,936	.....	.....
Western Canada	29	20	0	3	6	0	139,006	1,842	1,975	4	1	0	1	2	485	551

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	10-15-60	10-8-60	10-17-59
Pennsylvania	2,338	2,323	2,559
Other Appalachian	1,443	1,449	2,099
Illinois, Indiana, Michigan	9,007	8,972	9,553
Nebraska and North Dakota	2,727	2,825	3,189
Kansas	8,434	8,197	9,840
Oklahoma	15,217	14,926	14,473
Arkansas	1,842	1,790	2,018
Louisiana	17,824	18,209	17,695
North	2,995	2,967	3,172
South	14,829	15,242	14,523
Mississippi, Alabama, Florida	1,992	1,845	2,068
New Mexico	8,235	8,361	8,167
Texas	97,894	96,584	110,759
East Texas	7,505	7,691	8,074
West Texas	48,525	47,544	51,398
Texas Gulf	16,311	16,441	20,431
Other Texas	25,553	24,908	30,856
Wyoming	15,180	15,244	16,214
Other Rocky Mountain	9,802	9,656	9,535
California	25,804	26,159	28,945
Foreign	†13,814	13,448	14,698
Total	**231,553**	229,988	251,812

*Bureau of Mines. †Includes 4,556,000 bbl. in California.

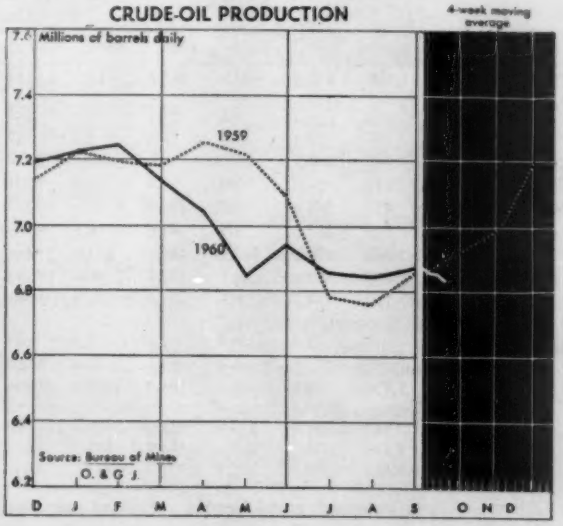
DAILY AVERAGE PRODUCTION FOR WEEK

	October 22, 1960			Oct. 15 total
	Crude oil	Lease condensate	Total	
Alabama	21,000	.....	21,000	21,000
Arkansas	77,100	200	77,300	77,625
California	826,800	.....	826,800	829,700
Colorado	130,100	.....	130,100	131,200
Eastern	39,800	.....	39,800	41,000
Florida	1,000	.....	1,000	1,000
Illinois	217,700	.....	217,700	217,900
Indiana	31,300	.....	31,300	31,400
Kansas	†293,870	.....	†293,870	†303,850
Kentucky	56,700	.....	56,700	56,900
Louisiana	945,800	125,650	1,071,450	1,071,150
North	104,800	5,900	110,700	110,400
South	841,000	119,750	960,750	960,750
Michigan	42,000	.....	42,000	41,900
Mississippi	134,000	3,800	137,800	137,800
Montana	82,300	.....	82,300	83,100
Nebraska	69,000	.....	69,000	68,400
Nevada	50	.....	50	50
New Mexico	285,000	8,700	293,700	293,700
North Dakota	61,400	.....	61,400	61,000
Oklahoma	†506,200	.....	†506,200	†502,300
Texas	2,331,000	82,575	2,413,575	2,413,575
Dist. 1	43,000	2,500	45,500	45,500
Dist. 2	97,000	8,100	105,100	105,100
Dist. 3	297,000	36,500	333,500	333,500
Dist. 4	169,000	11,900	180,900	180,900
Dist. 5	25,000	300	25,300	25,300
Dist. 6	101,000	10,000	111,000	111,000
East Texas field	121,000	.....	121,000	121,000
Dist. 7-B	121,000	150	121,150	121,150
Dist. 7-C	114,000	3,050	117,050	117,050
Dist. 8	948,000	7,500	955,500	955,500
Dist. 9	194,000	1,650	195,650	195,650
Dist. 10	101,000	925	101,925	101,925
Utah	32,500	.....	32,500	90,000
Wyoming	362,900	.....	362,900	359,700
Others	‡1,675	.....	‡1,675	‡1,625
Total U. S.	6,549,195	220,925	**6,770,120**	6,835,875
Change from previous week, down			**65,755**	
Canada	†505,200	.....	†505,200	†542,000

Total U. S. prod.—Jan. 1-Oct. 22 ..... 2,067,855,300 bbl.
Same period last year (crude plus cond.) .... *2,079,714,800 bbl.

*Includes 55,221,900 bbl. condensate. †Week ended previous Monday. ‡Alaska, South Dakota, and Arizona.

CRUDE-OIL PRODUCTION



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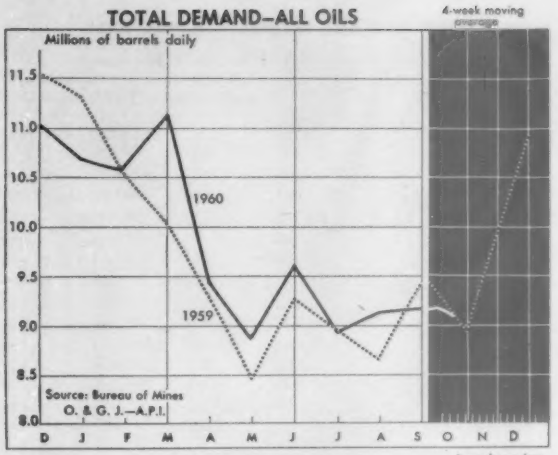

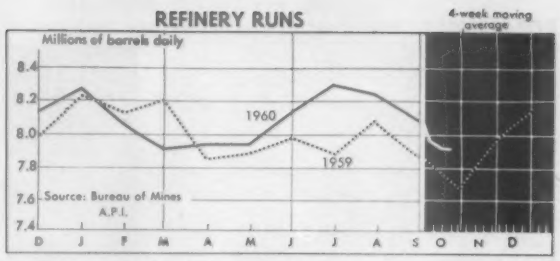

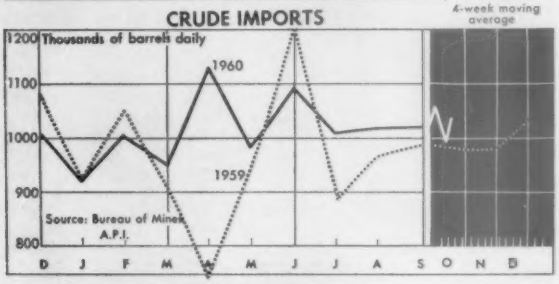

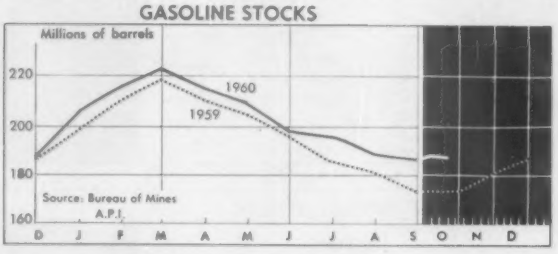

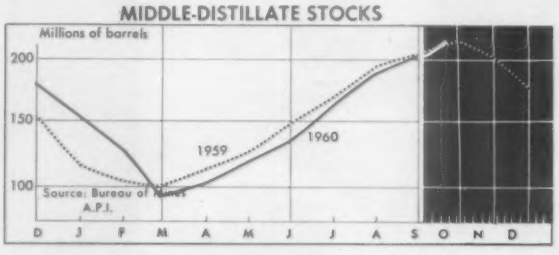

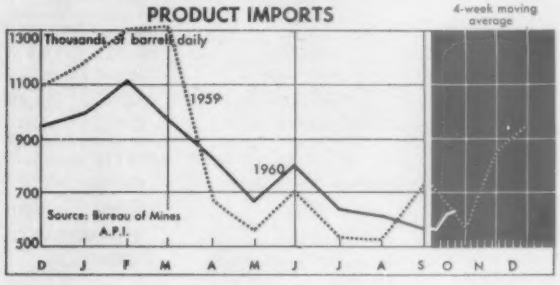

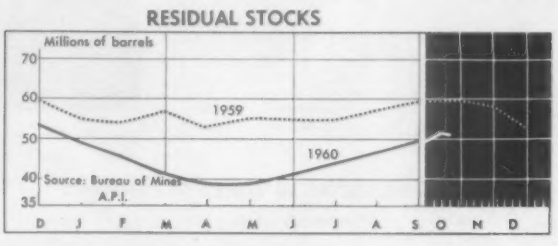

API REFINERY REPORT—OCTOBER 21, 1960

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, October 1959—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,196	495.0	44.9	345.3	140.0	44,254	14,766	70,763	14,117	1,051	469.7	21.3	325.0	150.0
Appalachian:														
District 1	60	21.4	1.4	13.1	6.6	5,857	822	4,614	557	91	39.3	2.5	20.0	9.0
District 2	107	55.4	7.1	18.4	9.0	2,947	544	1,775	257	104	51.3	5.8	17.9	8.8
Ind., Ill., Ky.	1,449	725.7	81.6	317.9	138.6	31,670	7,514	32,233	6,805	1,421	739.2	64.0	311.8	134.5
Minn., Wis., Dak.	115	51.9	10.0	29.1	12.9	6,210	1,645	8,976	601	71	31.2	0.8	14.9	11.3
Okla., Kans., Mo.	671	348.4	7.9	168.9	17.3	16,553	1,700	14,352	988	688	385.6	16.2	170.2	24.1
Inland Texas	276	232.3	8.0	41.6	16.3	6,790	591	1,614	2,552	287	212.4	9.1	48.7	18.2
Texas Gulf Coast	1,858	993.0	131.2	465.5	128.0	25,516	3,795	17,533	5,847	1,718	910.3	102.5	412.0	143.6
La. Gulf Coast	678	357.9	89.7	132.4	46.4	10,218	2,213	6,486	1,543	693	378.5	55.3	150.1	54.6
N. La. and Ark.	110	74.3	6.3	24.6	6.4	5,208	1,362	2,259	117	67	25.8	2.2	17.9	5.3
Rocky Mountain:														
New Mexico	12	7.3	0.4	2.4	1.3	682	44	138	30	27	14.7	0.5	5.3	2.8
Other	285	139.6	3.4	63.7	30.4	5,208	359	3,048	1,083	277	135.2	2.6	60.9	32.1
West Coast	1,130	540.8	25.1	195.4	219.4	25,889	1,452	13,841	16,432	1,152	507.1	3.8	181.3	275.0
Oct. 21, 1960	7,947	4,043.0	417.0	1,818.3	772.6	187,002	36,807	177,632	50,929	7,647	3,900.3	386.6	1,736.0	869.3
Oct. 14, 1960	7,898	4,074.0	408.1	1,694.7	819.7	188,159	35,987	175,066	51,427	.....	.....	.....	.....	.....
Oct. 23, 1959	7,662	3,890.9	305.7	1,750.4	843.1	178,017	33,176	181,445	58,699	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma	West Tex. (sour)	West Tex. (Inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Julesburg	Wyo. (sour)
14-14.9	$1.86	....	....	....	....	....	....	....	....
15-15.9	1.93	....	....	....	....	....	....	....	$1.81
16-16.9	2.00	....	....	....	....	....	....	....	1.86
17-17.9	2.06	....	....	....	....	....	....	....	1.91
18-18.9	2.13	....	....	....	....	....	....	....	1.96
19-19.9	2.20	....	....	....	....	....	....	....	2.01
20-20.9	2.27	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.33	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.40	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague.

Flat Prices

Louisiana:

Sweet Lake	$3.00

Texas:

East Texas	3.05-3.25
Conroe	3.23-3.53
Van	3.08

Pennsylvania Grade:

Bradford	$4.75-4.80
Middle District	4.52
Southwest Pennsylvania	4.25
West Virginia	4.17
Buckeye Grade	4.08
Illinois Basin	**3.00-3.05**

Foreign

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)

Arabian, 34.0°-34.9°, Ras Tanura	$1.80
Iranian, 34.0°-34.9°, Bandar Mashur	1.78
Iranian, 34.0°-34.9°, Abadan	1.73
Iraq, 35.0°-35.9°, Fao	1.72
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.59
Qata, 41.0°-41.9°, Umm Said	1.95

Middle East, E. Mediterranean:

Arabian, 34.0°-34.9°, Sidon	$2.17
Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli	2.19

Far East (cargoes, f.o.b. Lutong, Sarawak):

Seria Light, 36°	2.42

Canada:

Leduc-Woodbend	$2.53
Redwater (Alta.)	2.42
Smiley (Sask.)	2.18
Pembina	2.38

Venezuela:

Cumbarebo, 47°-47.9°, Tucupido	3.34
San Joaquin, 40°-40.9°, Puerto La Cruz	3.08
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Tanker Rates (Long Ton)

(Latest reported spot fixtures)

★ Gulf-NY, dirty (ATRS—15%)	$2.42
★ Carib.-UK, dirty (Scale—37.5%) (20s. 4d.)	2.86
★ PG-UK, dirty (Scale—37.5%) (36s. 21d.)	5.07
PG-Japan, dirty (USMC—60%)	4.08

★Denotes change from previous week.

Refined-Product Prices

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

Gasoline*

Mid-Continent (Group 3):

Regular (91 octane)	$12.25-12.50
Premium (99 octane)	15.00-15.25
Natural gasoline (26-70)	4.5
Breckenridge	4.0

Gulf Coast (cargoes for coastwise or export movements):

Regular (90 octane)	11.00
Regular (92 octane)	11.25
Premium (98 octane)	12.25

California (rack) Los Angeles:

Regular (88 octane)	11.65-12.15
Premium (94 octane)	12.65-13.15
Premium (100 octane)	14.00-14.65

Caribbean area (cargoes):

Regular (87 octane)	10.125-10.25
Premium (97 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

Kerosine and Distillate

Mid-Continent (Group 3):

★ Kerosine 42-44	10.375
★ Diesel oil (58 d.i. and above)	10.00
★ Distillate No. 1	10.00
★ Distillate No. 2	9.00

Gulf Coast (cargoes):

Kerosine 41-43	9.00- 9.25
Distillate No. 2	8.25

New York Harbor (barges):

Kerosine 41-43	10.45
Distillate No. 2	9.45
Diesel fuel, 48-52 d.i.	9.65

Caribbean area (cargoes):

Distillate No. 2	8.125

Residual Fuel (Bbl.)

Mid-Continent (Group 3):

Residual fuel (max. 1% S)	$1.90

Gulf Coast (cargoes):

Bunker C fuel	2.30

New York Harbor (barges):

Bunker C fuel	2.52

Caribbean (cargoes):

Bunker C	2.10

California (rack):

Bunker C fuel, Los Angeles	2.25

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SALES AND RENTALS. New or used portable floating bridges, trestle bridges and ferrys. Bub Gallaway, 4106 Ascot Lane, Houston, Texas. Phone OV 2-2334.

WALKER-NEER C-34, Automatic cathead, tools, doghouse, lightplant, float, GMC truck to move equipment. Phone S. H. Lindley, HI 9-2884, Breckenridge, Texas.

DOUBLE DRUM Unit w/spudder for servicing and workovers. Excellent condition. Now working. Box 736 Great Bend, Kansas. GLadstone 3-8817.

FOR SALE:

50,000 Ft. 12¾" OD .281" Wall, New Prime, Electric Weld Pipe API 5L Grade X-42 P. E. Bev., DRL.

$2.75 Per Ft.—Car Load Lots Only

7" OD 23# New Sub Std. Smls. Casing, 8-Rd-Thd ST&C Range 1 & 2 API Drifted and Hydrostatically Tested to 4,000 Lbs. PSI.

$1.75 Per Ft.—Loaded Cars or Trucks

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ROTARIES, SPUDDERS, Core Drills. Tank mounted service trucks. New & Used equipment. Complete supplies. Money-saving prices. Nation-wide service. If you want to buy or sell, contact: Pressey & Son, Pueblo, Colorado.

WALKER-NEER C-34 spudder with 145 GKU Waukesha engine. 6,000' ⅞" sand line, plastic covered hemp. 5,800' ¾" drill line, plastic covered hemp. Complete set of tools; tool house, skid mounted. All equipment in A1 condition. Contact Bradford Supply Company, Wichita Falls, Texas, Phone 723-2761.

10'' LINE PIPE

17,000'—10¾" O.D., 40.48# Lap-weld Line Pipe, 20' SRL, Fully Reconditioned, #1 Grade. Suitable line pipe or can shop for casing.

Located near Tulsa.

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400 HP Compressors; Towers; Vessels; Heat Exchangers; Pumps.

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HEAT EXCHANGERS

Steel Tube: 3280, 2100, 1200, 950 sq. ft.
Adm. Tube: 2800, 2700, 2600, 2100,
1700, 1500, 1375, 1250,
1100, 1000, 920, 650 sq. ft.
20 Fin Tubes: 50-190 sq. ft.

VESSELS & TOWERS

8' x 75' 20 Tray 25#	4' x 36' packed 210#
7½' x 56' 20 Tray 35#	10' x 55' 60#
3' x 58' 30 Tray 154#	6' x 42' 200#
3' x 47' 20 Tray 120#	6' x 20' 40#
18" x 32' 15 Tray 130#	12' x 43' 25#
2' x 30' packed 50#	

PUMPS

Hot Oil: 1"-6"; 50-400 gpm 100-3,000 ft. hd.
Boiler Feed: 190 gpm 1,500' hd.
Cooling Tower: 7,000 gpm 120' hd.
River Water Sump: 1,000 gpm 59' hd.

STORAGE TANKS & SPHERES

15 Storage Tanks welded: 29,000, 10,000, 5,000, 3,750 barrel.
5 Spheres-Spheroids: 5,000, 10,000 barrel.

1—Carrier 1,000 ton refrigeration Compressor Turbine drive. (1953)
2—IR Turbo Exhausters 15,300 & 17,000 CFM 4.85 PSIG with Turbine Drives.
1—Clark Centrifugal Compressor 10,000 CFM—240 PSI discharge. (1953).

OTHER FEATURED ITEMS

1 Lummus: 35 mil. BTU furnace
2 Petro-Chem. Furnace: 1¼ mil. & 8 mil. BTU
2 B&W Boilers: 70,000# per hr.-450#
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35-65 Jabez St. Newark 5, N. J., MA 3-7420

FOR SALE EQUIPMENT

CLARK GAS Compressor Model MA-4 (8¼ x 8¼) Two Stage 25#—800#, complete with steel Fabricated House. Located Driscoll, Texas. $12,500.00. Spartan Well Service, 207 Sun-Texaco Bldg., Corpus Christi, Texas. Phone TU-37869.

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1—CHICAGO PNEUMATIC Rotary Compressor, new GM Diesel Model # 900 RO-2, a real bargain. For additional information contact Wm. D. Brownlee & Co., 244 S. College St., Washington, Pa. Phone: BA 5-3355.

3 LE ROI V-12 RX15VW gas/butane engines. Complete with radiators, skids, clutches, starting engines. Two engines good condition $3,000 each. One recently overhauled $3,500. 3814 N. Santa Fe, Oklahoma City, Oklahoma.

TRAILER MOUNTED 55 Failing Rotary, Low Boy mounted 5 x 10 pump new 10 inch Table, Truck and trailer complete except Drill Pipe. L. C. McLaughlin Drilling Co., 610 East 61st Street North, Wichita, Kansas, Telephone SH 4-1232.

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ROTARY DRILLING Rig for sale. 1,200 ft. capacity. Overhauled. Double drum $8,000. Los Angeles, DI 0-6696.

1 - USED Model #10 Cyclone rotary drill mounted on good 1955 2-ton Chevrolet truck. Drill powered by Ford Industrial engine. Drill equipped with hydraulic top head rotary table, hydraulic pull-down, derrick raised by 2 hydraulic cylinders, Moyno mud pump, drill rods, subs and bits, breakout tongs, portable mud pit. FOR THE SUM OF $3,500.00. Sanderson Cyclone Drill Co., Orrville, Ohio.

CARDWELL WELL Servicing Unit, Serial No. HS 803, 8" & 10" telescope pole with three standard sheaves, six cylinder Waukesha engine, mounted on 3 ton Dodge truck. This unit is in excellent condition. $2,000.00 Jamison Pipe & Tool Co., Madison, Kansas, Phone 80.

EQUIPMENT WANTED

TRUCK EQUIPPED for fracturing. Also interested in pumps for frac truck. Phone DA 1-4680, El Dorado, Kansas.

WANTED: Packaged gas compressor unit with 40 to 55 HP compressor (preferably Worthington) with cylinder to stand 600 or more PSI and gas engine all skid mounted. Box M-139, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

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Graduate Mechanical Engineer with a minimum of five years process industry experience in various phases of Mechanical Engineering.

Send detailed resume of experience, education and salary requirements to:

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NATIONAL COOPERATIVE REFINERY ASSOCIATION
BOX 770, MCPHERSON, KANSAS

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With proven ability and experience in principal producing areas of Louisiana, Texas and New Mexico for position of chief geologist, sizable company having progressive, moderate size independent exploration and production division with several district offices in various areas, in addition to principal production and exploration office. Must have good records of discoveries. 38 to 45 years of age. Will pay well for right man.

Send complete details with recent photograph to:

Box M-144
The Oil and Gas Journal
Tulsa, Oklahoma

HELP WANTED

HELP WANTED

REFINERY COST ESTIMATOR

West Coast Independent Oil Company has immediate need for qualified degree engineer with 10 to 20 years experience in engineering, construction and cost estimating. Duties involve the development and maintenance of cost standards; "flow-sheet" estimating for economic studies; estimating major construction projects; budget preparation and cost control. Minimum of 6 years experience in cost estimating for major contract work required.

Inquiries held confidential.

Forward resume,
including education, background and references to:

Box L-991
The Oil and Gas Journal
Tulsa, Oklahoma

ENGINEER—Mechanical or Industrial. Experienced in design or manufacturing. Reply giving resume of experience and education. All replies held in strict confidence. Tulsa location. Box M-152, The Oil and Gas Journal, Tulsa, Oklahoma.

NEW OIL JOB Directory, foreign and domestic, showing where to apply for jobs. 500 selected producing, refining, butane and pipeline companies. Nationwide, $5.00 cash. OIML Co., Box 2003, Tulsa, Oklahoma.

EXPLORATION GEOLOGIST, must have both South Louisiana and Texas Gulf Coast experience of not less than 10 years in exploration. Age 35 to 45. Resume and photo to: Box M-143, The Oil and Gas Journal, Tulsa, Oklahoma.

YOUNG PETROLEUM engineer to age 30 with approximately 3 years drilling and production field experience preferably with major company for employment with large independent producer. To reside and work at present time in eastern Oklahoma. Should be available in immediate future. Salary commensurate with ability and experience. Box M-142, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING OR MECHANICAL ENGINEERS 2 to 8 years experience. Global Marine Exploration Co., 650 So. Grand, Los Angeles 17, Calif.

STAFF ENGINEER: Owner and operator of several natural gas processing plants, with home office in north Louisiana, has immediate need for man with engineering degree and at least five years experience in operation of gas processing plants and related facilities. Duties involve maintenance and process trouble shooting and general plant engineering. Salary commensurate with experience and ability. Submit recent photograph and complete resume of formal education and employment history to: Box M-138, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

SUBSURFACE GEOLOGIST, 6 years experience Gulf Coast, Venezuela, married, consider any position or location. Box M-131, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER, 15 years refining industry experience, startup, operations, economics, supervision, planning, domestic and foreign, available immediately, any location. Box M-148, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

LANDMAN, COMPLETE background in all phases of exploration and capable of handling complete land department functions desires challenging opportunity with independent or small major. Box M-150, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING SUPT., with good administrative background in foreign operations desires foreign employment. Box M-145, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER: B.S., 28, married. Presently employed by major. Three years varied field experience in Kansas and West Texas, with emphasis on drilling and completion. Desires to relocate with active company or Independent. Box M-149, The Oil and Gas Journal, Tulsa, Okla.

EXECUTIVE, AGE 43, Naval Academy graduate. Presently treasurer and general manager, available soon. Experience includes leasing, drilling, production, purchasing, accounting, financing (public, private, debt, and equity,) taxes, contracts, administration, farmouts. An extra is 4,000 hours flying experience. Box M-147, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER: Four years diversified, production. O.U. graduate, age 33. Will relocate: Harold Lechtenberg, 5101 N.W. 47th, Oklahoma City.

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WANTED: Settled Production: 20 to 100 bbl. per day in Oklahoma or Kansas. Box M-141, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION FOR SALE

WATERFLOOD FOR SALE

Labette County, Kansas, 100 acres floodable. 14 acres now in operation as pilot flood lease, all electrified and oil lines and water input lines laid, water supply well and complete treating plant in operation.

The Veeder Supply & Development Co., Cherryvale, Kansas

LEASE AND DRILLING BLOCKS

CAN FURNISH two thousand acre block solid, ten year leases, Good geology, Excellent gas prospect, Central Texas. Box M-140, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: 160 acres perpetual minerals in Ellis County near drilling. Jess Harris, First National Bldg., Oklahoma City.

DRILLING DEAL wanted, share basis, or will sell one-half interest. Large lease acreage; Williston Basin, South Dakota. Excellent oil and gas subsurface geological reports. E. E. Erdman, Postoffice Box 424; Trenton, Nebraska.

Proven locations to drill; tremendous intrastate market; thirty producing days a month; substantial reserves, practically up against the market; numerous interlacing pipelines, that will take production for petrochemical plants nearby. Principals, financially able to drill, will only be considered.

Box M-136, The Oil and Gas Journal Tulsa, Oklahoma

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Commercial Development Division
Union Oil Co. of Calif.
P. O. Box 76, Brea, California

LEASE AND DRILLING BLOCKS

WILL BUY PRODUCING Royalty, Minerals, or Overrides. Send price and particulars to American Mutual Oil Company, 1640 Court Place, Denver 2, Colorado.

FULLY EQUIPPED Sunset Oil well producing $900 for sale. $11,000 will salvage much more. MU 1-9458, 504 Hollingsworth Bldg., Los Angeles.

CUMBERLAND COUNTY, Kentucky: 1,600 acres checkerboarded old Granville Sand. Shallow producing oil field. New drilling should test Lebanon and Knox formations. Long term leases. Price $3.50 per acre. Write wire, phone. W. V. Cravens. Russell Springs, Kentucky.

FOR SALE: Proven 25 acres offset to water flood. 750 ft. Bartlesville Sand. $400.00 per ⅛ test 1st well. Own rig and tools. Eastern Kansas. Well ready to start. Box M-153, The Oil and Gas Journal, Tulsa, Oklahoma.

NOTICE—SALE OF OIL AND GAS MINING LEASES TRIBAL AND ALLOTED INDIAN LANDS

Department of the Interior Bureau of Indian Affairs Consolidated Ute Indian Agency Ignacio, Colorado

SEALED BIDS will be received until 2:00 P.M. Mountain Standard Time, November 15, 1960, and opened at that time in the Office of the Superintendent Consolidated Ute Indian Agency, Ignacio, Colorado, for the leasing of 17,423.98 acres of Tribal land and 1,518.63 acres of allotted Indian land, located in Township 33 N., Ranges 3 and 4W., N.M.P.M., Archuleta County, Colorado, Township 34N., Range 7W., N.M.P.M., La Plata County, Colorado, Township 32N., Ranges 15 and 16 W., N.M.P.M., Montezuma County, Colorado, Township 35 S., Ranges 20 and 21 E., S.L.M., San Juan County, Utah, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of the Consolidated Ute Indian Agency, at Ingacio, Colorado.

CAPITAL AVAILABLE

CLIENT DESIRES to purchase profitable oil and/or gas production. Must stand rigid inspection. Reply in detail to W. K. Barker, Geologist and Petroleum Engineer, 1701 Westridge Rd., Los Angeles 49, California.

BUSINESS OPPORTUNITIES

U.S. GOLD supply dwindling. 160 acre claims in gold areas, Colo., New Mex. free if filed now. Write Mineral Surveys, Fanshawe, Okla.

PUBLICLY HELD producing company showing small profit with $350,000.00 tax loss available for merger. Has many proven locations with ready gas market at 25 cents per M. Box M-146, The Oil and Gas Journal, Tulsa, Oklahoma.

OILFIELD PRODUCTION equipment manufacturer has several choice areas open on exclusive distributorship basis. Write to P. O. Box 7288, Houston 8, Texas, or visit Booth B-27 and B-28 at Permian Basin Oil Show.

I OWN AND am going to sell Geological Library, over 1,300 surface maps covering Oklahoma. Opportunities unlimited as basis for exploration by and development of a new company. Box M-109, The Oil and Gas Journal, Tulsa, Oklahoma.

FINANCIAL—Investment Banking Houses and Underwriters reached. Confidential. You can send the details of your proposition direct or thru your attorney to Consultant 817—51st Street, Brooklyn, N. Y.

ATTENTION: OIL INVESTORS

What are your problems? Individual with 20 years experience all phases oil and gas exploration, development, and operations desires connection with oil investors as industry representative or consultant. Particularly adept at income tax matters, management, and exploration techniques designed to find more oil and gas reserves for less money. Reply: Box M-151, The Oil and Gas Journal, Tulsa, Okla.

NEW JOURNAL MANUALS

You will want one or more of these recently released technical manuals for your working library.

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for the pipeline engineer. Crude-oil, products, and natural gas pipelines.

B. PROCESS COST-IMATING
Part 1 of W. L. Nelson's series on estimating operating costs.

C. PROCESS INSTRUMENTATION-AUTOMATION
Instrumentation and process control, including the use of analyzers, loggers, and computers.

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THE OIL AND GAS JOURNAL
P. O. Box 1260 **Tulsa, Okla.**

BP Opens Refinery

. . . in West Germany. New line supplies crude.

BRITISH Petroleum has officially inaugurated its new 100,000-bbl. refinery at Dinslaken, West Germany.

At its first stage of development, the refinery has two 50,000-bbl. distillation units which give the plant an annual capacity of 4.4 million tons of crude per year, or about 88,000 bbl. per calendar day.

Other units on stream include a catalytic reformer, hydrofiner, copper chloride treating units, and a sulfur recovery plant.

Construction is already started on the second stage, which includes addition of a catalytic cracker, an associated vacuum unit, and an asphalt plant.

The refinery, owned and operated by the BP Group's German associate, BP Benzin und Petroleum A.G., Hamburg, will be supplied with crude by the Wilhelmshaven-Cologne pipeline, which is already in operation and in which BP has an interest.

Among the design features of the refinery is an "in line" system for blending finished products. Most products are stored in component form, and a blender is run to make particular finished products.

About half the output will be distributed by barges on the Rhine River. These will be loaded at a new harbor built at the junction of the Rhine and Lippe-Seiten canal. The harbor is linked to the refinery by a 3-mile pipeline system. Other products will be distributed via pipeline and rail.

The new refinery brings the total BP investment in West Germany in the past 12 years to more than $210,600,000.

Gulf Plans Europe Refinery

GULF Oil will build a 30,000-bbl. refinery in either Denmark or Sweden.

The company said it is making the move to meet its marketing needs in Europe. It is now acquiring options on land sites in the two countries that would be suitable locations.

The refinery will be designed to handle all types of crude available to the European area, rather than one specific type oil. The yields will be geared to the company's marketing needs in the area.

If a site in Denmark is selected, the plant will be the second in the country. Tidewater Oil has a 20,000-bbl. plant under construction at Kalundborg.

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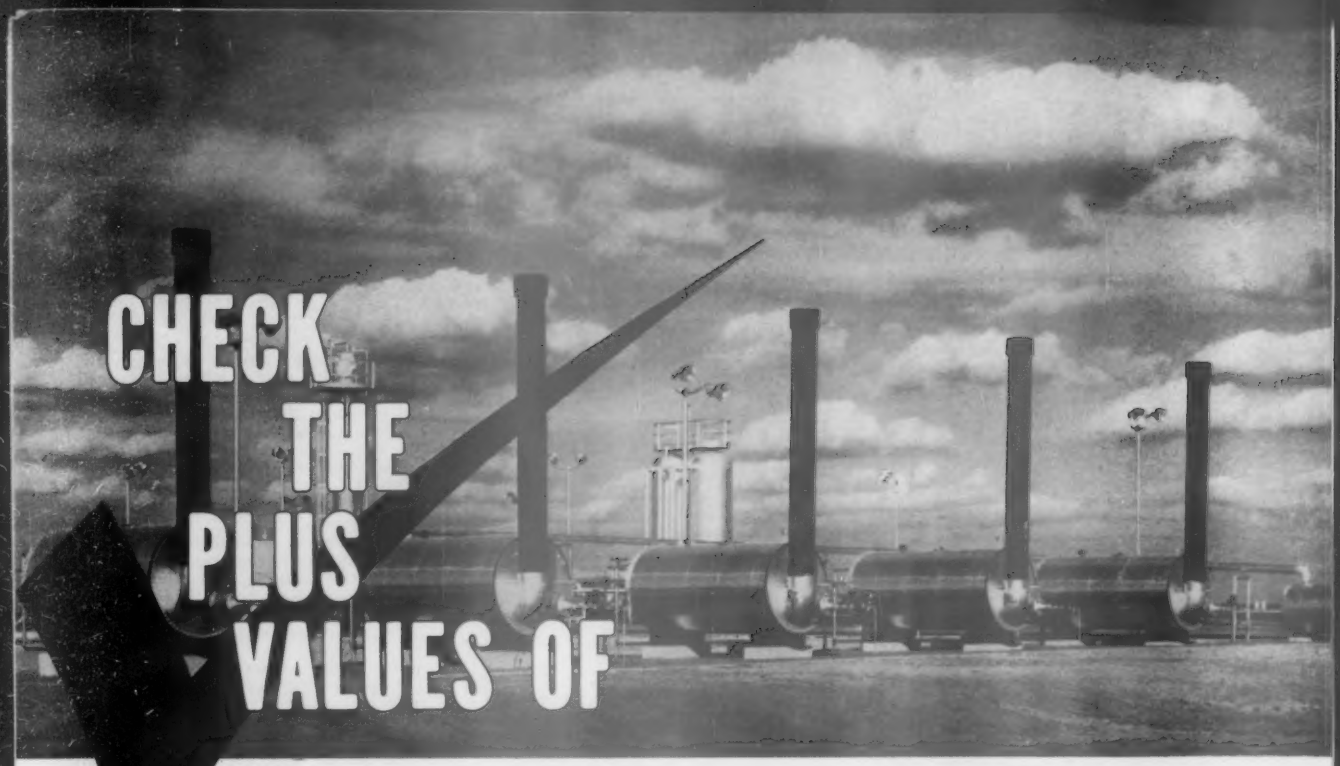

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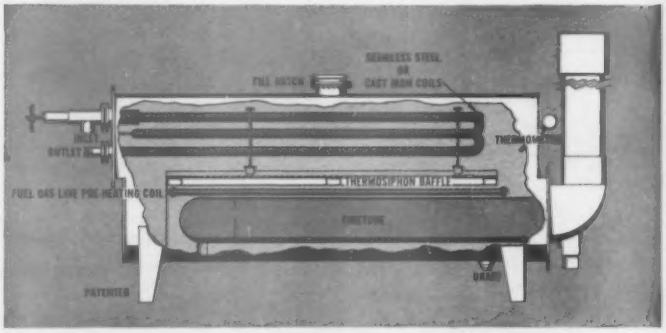

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